CAREER AND TECHNICAL EDUCATION PROGRAM OF STUDIES HIGH SCHOOL

2019 - 2020

KENTUCKY DEPARTMENT OF EDUCATION
OFFICE OF CAREER AND TECHNICAL EDUCATION

CAREER AND TECHNICAL EDUCATION PROGRAM OF STUDIES – HIGH SCHOOL 2019 – 2020

TABLE OF CONTENTS

AGRICULTURAL EDUCATION 26
AGRICULTURAL EDUCATION CAREER PATHWAYS 27
Agribiotechnology Systems CIP 26.1200.00 27
Agribusiness Systems CIP 01.0101.00 28
Agricultural Power, Structural, Technical Systems CIP 01.0201.00 29
Animal Science Systems CIP 01.0901.00 30
Environmental Science and Natural Resources Systems CIP 03.0101.00 31
Food Science and Processing Systems CIP 01.1001.00 32
Horticulture and Plant Science Systems CIP 01.1101.00 33
AGRICULTURAL EDUCATION COURSES 34
Advanced Agricultural Economics and Agribusiness Management 010101 34
Agri-biology Interdisciplinary 030713 35
Agribiotechnology 020210 36
Agribusiness and Farm Management 010131 37
Agricultural Education Co-op 030790 38
Agricultural Education Internship 030791 39
Agriculture Communications 010110 40
Agriculture Construction Skills 010241 41
Agriculture Employability Skills 010121 43
Agriculture Math (CTE Credit) 030707 44
Agriculture Math (Math Credit) 030708 44
Agriculture Power and Machinery Operation 010212 45
Agriculture Sales and Marketing 010111 46
Agriculture Structures and Designs 010211 47
Agriscience (CTE Credit) 030711 48
Agriscience (Science Credit) 030712 48
Animal Science 020501 49

Animal Technology 020502 50
Aquaculture 020520 51
Crop Technology 010610 52
Environmental Science and Technology 030609 53
Equine Science 020510 54
Floriculture and Floral Design 010621 55
Food Processing, Distribution, and Marketing 010701 56
Food Science and Technology 010702 57
Forestry 030610 58
Greenhouse Technology 010641 59
Introduction to Greenhouse and Crop Production 010611 60
Landscape and Turf Management 010631 61
Leadership Dynamics - Agriculture 030702 62
Nursery and Orchard Technology 010651 63
Principles of Agricultural Science and Technology 030715 64
Small Animal Technology 020503 65
Small Power and Equipment 010231 66
Veterinary Science 020511 67
Wildlife Resources 030611 68
BUSINESS AND MARKETING EDUCATION 69
BUSINESS AND MARKETING EDUCATION CAREER PATHWAYS 70
Accounting CIP 52.0301.00 70
Administrative Support CIP 52.0401.00 71
Business Education TRACK CIP 52.0101.99 72
E-Commerce CIP 52.0208.02 73
Financial Services CIP 52.1908.00 74
High School of Business CIP 52.0201.02 75
Hospitality, Travel, Tourism and Recreation CIP 52.1910.00 76
Informatics CIP 11.0802.00 77
Management and Entrepreneurship CIP 52.0701.00 78
Marketing CIP 52.1401.01 79
Marketing Education TRACK CIP 52.1400.99 80
Retail Services CIP 52.1803.00 81
BUSINESS AND MARKETING EDUCATION COURSES 82

Accounting and Finance Foundations 060122 82
Advanced Accounting 070125 84
Advanced Multimedia Publishing 060761 86
Advertising and Promotion 081511 87
Business and Marketing Career Exploration 060195 89
Business and Marketing Essentials 060111 90
Business Communications 060155 91
Business Economics (CTE Credit) 080317 93
Business Economics (Economics Credit) 060596 95
Business Education Co-Op 060107 97
Business Education Internship 060108 98
Business Law 060121 99
Business Math (CTE Credit) 080772 101
Business Math (Math Credit) 080780 102
Computers, Networks, and Databases 111001 103
Data Modeling/SQL 070331 104
Databases in the Cloud 111003 105
Design for the Digital World 111002 106
Developing a Cloud Presence 111004 107
Digital Literacy 060112 108
Ethical Leadership 060109 110
Fashion Marketing 080111 111
Fashion Marketing Management 080132 112
Financial Analysis for Managers 060399 114
Financial Management 070122 116
Financial Services I 060311 117
Financial Services II 060351 118
Fundamentals of Social Media Marketing 081310 119
International Business 060188 121
Introduction to Finance 060301 122
Introduction to Management 060411 124
Leadership Dynamics 080799 126
Legal Office 070881 127
Marketing Applications 080717 128

Marketing Education Co-Op 080707 130
Marketing Education Internship 080708 131
Marketing Principles 080716 132
Medical Office 070971 134
Microsoft Office Specialist (MOS/MCAS) 070750 136
Multimedia Publishing 060751 137
Office Administration 070743 138
Personal Finance (CTE Credit) 060170 140
Personal Finance (Math Credit) 080719 142
Principles of Entrepreneurship 080310 144
Principles of Hospitality 080910 146
Promotional Applications and Media 081512 147
Retail Marketing 081411 148
Retail Marketing Management 081431 150
Sports and Event Marketing 081121 151
Touch Keyboarding 060114 153
Travel and Tourism Marketing 080911 154
Web Page Design 060199 155
CONSTRUCTION TECHNOLOGY 156
AIR CONDITIONING TECHNOLOGY PATHWAYS 157
Construction Track CIP 46.0000.99 157
Environmental Control System Technician CIP 47.0201.05 158
AIR CONDITIONING TECHNOLOGY COURSES 159
Commercial Refrigeration 460822 159
Cooling and Dehumidification 460824 161
Co-Op (Air Conditioning) 460880 163
Electrical Components 460826 164
Green Awareness/Energy Management 460806 166
Heat Load/Duct Design 480812 168
Heat Pump Application 460801 170
Heating and Humidification 460820 171
HVAC Electricity 460817 175
Ice Machines 460845 176
Industrial Safety 499930 177

Internship (Air Conditioning) 460883 178
Journeyman Preparation 460846 179
Refrigeration Fundamentals 460828 180
Residential Energy Auditor Prep 460804 183
Sheet Metal Fabrication 460847 185
Special Problems (Air Conditioning) 460877 186
Special Topics (HVAC) 460890 187
BUILDING AND APARTMENT MAINTENANCE PATHWAYS 188
Construction Track CIP 46.0000.99 188
Residential Maintenance Carpenter Assistant CIP 46.0401.01 189
BUILDING AND APARTMENT MAINTENANCE COURSES 190
Basic Blueprint Reading 499920 190
Basic Troubleshooting 499925 191
Co-Op (Building and Apartment Maintenance) 460229 192
Electrical Components 460826 193
Industrial Safety 499930 194
Internship (BAM) 460232 195
Introduction to Building and Apartment Maintenance 460241 196
Introductory Masonry 460112 198
Refrigeration Fundamentals 460828 200
Residential Energy Auditor Prep 460804 202
Residential HVAC Maintenance 460818 204
Residential Interior Maintenance 460222 205
Residential Maintenance Carpentry 460220 206
Residential Maintenance Masonry 460114 207
Residential Maintenance Plumbing 460516 208
Residential Maintenance Wiring 460333 209
Sheet Metal Fabrication 460847 210
CONSTRUCTION CARPENTRY TECHNOLOGY PATHWAYS 211
Construction Architectural Engineering CIP 15.101.02 211
Construction Track CIP 46.0000.99 212
Residential Carpenter Assistant CIP 46.0201.02 213
Skilled Trades Commercial Carpentry Track CIP 46.0201.99 214
Structural Engineering CIP 14.0803.00 215

CONSTRUCTION CARPENTRY TECHNOLOGY COURSES 216
Cabinet Construction and Installation 460209 216
Ceiling and Roof Framing 460213 218
Construction Forms 460218 220
Construction Prints 460217 221
Co-Op (Carpentry) 460242 223
Exterior and Interior Finish 460219 224
Floor and Wall Framing 460212 226
Industrial Safety 499930 228
Introduction to Construction Technology 460201 229
Internship (Carpentry) 460245 230
Site Layout and Foundations 460214 231
Special Topics (Construction Carpentry) 460298 232
ELECTRICAL TECHNOLOGY CAREER PATHWAYS 233
Construction Track CIP 46.0000.99 233
Electrical Construction Engineering CIP 15.0303.00 234
Industrial Electrician Assistant CIP 46.0302.02 235
Skilled Trades Construction Electrical Track CIP 46.0302.99 236
ELECTRICAL TECHNOLOGY COURSES 237
Basic Blueprint Reading 499920 237
Basic Troubleshooting 499925 238
Circuits I 460316 240
Circuits II 460319 242
Co-Op (Electrical) 460345 244
Electrical Construction I 460312 245
Electrical Construction II 460313 248
Electrical Motor Controls 460331 251
Industrial Safety 499930 253
Internship (Electrical) 460348 254
National Electrical Code 460339 255
Renewable Energy Systems 460342 257
Renewable Energy Systems (Special Problems) 460344 258
Rotating Machinery 460323 259
Rotating Machinery Electrical Motor Controls 460325 261

Special Problems – Electrical Technology 460377 263
Special Topics – Electrical Technology 460399 264
Sustainable Energy Systems 460340 265
Transformers 460305 267
HEAVY EQUIPMENT SCIENCES CAREER PATHWAYS 269
Construction TRACK CIP 46.0000.99 269
Heavy Equipment Sciences CIP 49.0202.01 270
HEAVY EQUIPMENT SCIENCES COURSES 271
Basic Blueprint Reading 499920 271
Basic Troubleshooting 499925 272
Heavy Equipment Operation 460404 273
Heavy Highway Construction Equipment Repair 460403 274
Industrial Education Co-op 499910 275
Industrial Education Internship 499915 276
Industrial Safety 499930 277
Introduction to Construction Technology 460201 278
Special Topics – Heavy Equipment 460499 279
MASONRY TECHNOLOGY CAREER PATHWAYS 280
Bricklayer Assistant CIP 46.0101.01 280
Construction TRACK CIP 46.0000.99 281
Skilled Trades Masonry TRACK CIP 46.0101.99 282
MASONRY TECHNOLOGY COURSES 283
Advanced Masonry 460113 283
Anchors and Reinforcement 460117 284
Basic Blueprint Reading 499920 285
Concrete Finishing 460119 286
Co-op (Masonry) 460180 287
Fireplace Construction 460118 288
Industrial Safety 499930 289
Intermediate Masonry 460116 290
Internship (Masonry) 460183 292
Introductory Masonry 460112 293
Residential Maintenance Masonry 460114 295
Special Problems 460179 296

PLUMBING TECHNOLOGY CAREER PATHWAYS 297
Construction TRACK CIP 46.0000.99 297
Plumber Assistant CIP 46.0501.02 298
PLUMBING TECHNOLOGY COURSES 299
Basic Plumbing Skills 460513 299
Bathroom Install 460514 300
Co-op (Plumbing) 460518 301
Industrial Safety 499930 302
Internship (Plumbing) 460521 303
Introduction to Plumbing 460511 304
Kitchen Install 460515 305
Plumbing Systems 460512 306
Special Problems – Plumbing 460599 307
EDUCATION AND TRAINING 308
EDUCATION AND TRAINING CAREER PATHWAYS 309
Teaching and Learning CIP 13.0101.00 309
EDUCATION AND TRAINING COURSES 310
Collaborative Clinical Experience 331033 310
The Learner-Centered Classroom 331031 311
The Learning Community 331030 313
The Professional Educator 331032 315
Principles of Career and Technical Education 331034 317
ENGINEERING TECHNOLOGY EDUCATION 319
ENERGY CAREER PATHWAYS 320
Energy Management CIP 15.0503.02 320
Sustainability and Energy Application Technician CIP 15.0503.01 321
ENERGY COURSES 322
Alternative Energy 210243 322
Energy I: Energy Industry Basics 210245 323
Energy II: Power Generation and Distribution 210246 324
Energy III: Emerging Technologies in Energy 210247 325
Energy IV: Sustainability Management 210248 326
Engineering Co-op 210330 327
Engineering Internship 210331 328

Foundations of Energy 210341 329
Global Energy Issues 210244 330
Introduction to Alternative Energy 210242 331
Power and Energy Equipment Technology 210142 332
ENGINEERING CAREER PATHWAYS 333
Aerospace Engineering CIP 14.0201.01 333
Automation Engineering CIP 15.0613.00 334
Civil Engineering CIP 14.0801.00 335
Electrical/Electronics Engineering CIP 14.1001.00 336
Engineering Design CIP 15.1302.00 337
Mechanical Engineering CIP 14.3501.00 338
CTE-ENGINEERING HYBRID CAREER PATHWAYS 339
Automotive Engineering CIP 15.0803.00 339
Computerized Manufacturing and Machining (CMM) Engineering CIP 48.0510.00 340
Construction Architectural Engineering CIP 15.0101.02 341
Design Engineering CIP 15.1304.00 342
Electrical Construction Engineering CIP 15.0303.00 343
Fabrication Engineering CIP 14.1901.00 344
Industrial Maintenance Engineering CIP 14.4101.00 345
Structural Engineering CIP 14.0803.00 346
Welding Engineer CIP 15.0614.00 347
Wood Manufacturing Engineering CIP 03.0509.00 348
ENGINEERING COURSES 349
Advanced Design Applications 210117 349
Aerospace Engineering 210229 351
Architectural Design 210140 353
Building Construction Technologies 210141 354
Civil Engineering 210223 355
Electrical/Electronics Engineering 210232 356
Engineering I 210221 357
Engineering II 210222 358
Engineering Capstone 210110 359
Engineering Co-op 210330 360
Engineering Internship 210331 361

Environmental Engineering 210250 362
Industrial Engineering 210135 363
Introduction to Aerospace 210226 364
Manufacturing Engineering 210225 365
Mechanical Engineering 210118 366
Mechatronics Engineering 210230 367
Robotics Automation and Design 210239 368
Robotics Engineering 210238 369
Space Systems Engineering I 210235 370
Space Systems Engineering II 210236 371
Technical Design I 210138 372
Technical Design II 210108 373
Unmanned Aircraft Systems 210251 374
FLIGHT AND AVIATION CAREER PATHWAYS 375
Aircraft Maintenance Technician CIP 47.0607.00 375
Flight and Aeronautics CIP 49.0102.00 376
FLIGHT AND AVIATION COURSES 377
Aerospace Engineering 210229 377
Aviation Capstone 210240 379
Aviation Science 210234 380
Commercial Aviation Science 210237 381
Engineering Co-op 210330 382
Engineering Internship 210331 383
Fundamentals of Aviation Science 210233 384
Introduction to Aerospace 210226 385
Introduction to Aircraft Maintenance Technology 210139 386
Unmanned Aircraft Systems 210251 387
FAMILY AND CONSUMER SCIENCES EDUCATION 388
FAMILY AND CONSUMER SCIENCES EDUCATION CAREER PATHWAYS 389
Consumer and Family Management CIP 19.0403.00 389
Consumer and Family Management TRACK CIP 19.0403.99 390
Culinary and Food Services CIP 12.0500.00 391
Early Childhood Education CIP 13.1210.00 392
Early Childhood Education Track CIP 13.1210.99 393

Fashion and Interior Design CIP 50.0407.00 394
Food Science and Dietetics CIP 51.3199.00 395
Fundamentals of Teaching CIP 13.1308.00 396
Hospitality, Travel, Tourism and Recreation CIP 52.1910.00 397
FAMILY AND CONSUMER SCIENCES COURSES 398
Advanced Foods and Nutrition 200442 398
Child Development Services I 200261 400
Child Development Services II 200262 401
Consumer Economics within Social Studies 201015 402
Co-op: Consumer and Family Management 200191 404
Co-op: Culinary Arts 200409 405
Co-op: Early Childhood Education 200210 406
Co-op: Fashion and Interior Design 200810 407
Co-op: Food Science and Dietetics 200491 408
Co-op: Fundamentals of Teaching 200291 409
Co-op: Hospitality, Travel, Tourism and Recreation 200690 410
Culinary Arts I 200411 411
Culinary Arts II 200412 413
Early Lifespan Development 200223 415
Entrepreneurship 080310 416
FACS Essentials 200113 418
FACS Essentials Health 200161 420
FACS Leaders at Work 200199 422
Fashion and Interior Design I 200821 424
Fashion and Interior Design II 200825 425
Fashion and Interior Design III 200826 427
Foods and Nutrition 200441 428
Fundamentals of Dietetics 200414 430
Internship: Consumer and Family Management 200192 431
Internship: Culinary Arts 200478 432
Internship: Early Childhood Education 200201 433
Internship: Fashion and Interior Design 200801 434
Internship: Food Science and Dietetics 200492 435
Internship: Fundamentals of Teaching 200292 436

Internship: Hospitality, Travel, Tourism and Recreation 200601 437
Middle to Late Lifespan Development 200226 438
Money Skills 201010 439
Money Skills for Math 201011 441
Nutritional Food Science 200415 443
Nutritional Food Science (Interdisciplinary) 200416 444
Parenting 200173 445
Principles of Hospitality 200610 446
Principles of Teaching 331020 447
Relationships 200171 449
Specialized Services in Hospitality 200641 450
HEALTH SCIENCE 451
HEALTH SCIENCE CAREER PATHWAYS 452
Allied Health CIP 51.0000.01 452
Dental Assisting CIP 51.0601.01 453
EKG Technology/Technician CIP 51.0902.01 454
Emergency Medical Technician CIP 51.0904.01 455
Medical Administrative Assisting CIP 51.0710.00 456
Patient Care Technician CIP 51.1614.00 457
Pharmacy Technician CIP 51.0805.01 458
Phlebotomy Technician CIP 51.1009.01 459
PLTW Biomedical Sciences CIP 26.0102.00 460
Pre-Nursing CIP 51.2699.01 461
Veterinary Assistant CIP 51.0808.00 462
HEALTH SCIENCE COURSES 463
Acute Care Basic Skills 170502 463
Advanced Veterinary Assisting Skills 170803 464
Allied Health Core Skills 170501 465
Applied Sports Medicine 170302 466
Biomedical Innovation 170704 467
Body Structures and Functions 170167 468
Co-op (Nursing) 170601 469
Development of Care Giver Role 170611 470
EKG Technician 170555 472

Emergency Medical Technician (EMT) 461022 475
Emergency Procedures 170141 477
EMS Training 461023 478
Essentials of Sports Medicine 170301 480
Health Science Microbiology/Infection Control 170640 482
Human Body Systems 170702 483
Internship: Allied Health 170550 484
Internship: Dental Assistant 170552 485
Internship: Medical Administrative Assistant 170922 487
Introduction to Nursing and Health Care System 170610 488
Leadership Dynamics 170199 489
Medicaid Nurse Aide 170631 490
Human Body Systems 170702 492
Medical Laboratory Aide (Phlebotomist) 170567 493
Medical Math 170169 496
Medical Office Procedures 170920 497
Medical Terminology 170131 499
Pharmacological and Other Therapeutic Modalities 170614 500
Pharmacy Technician 170558 501
Principles of Biomedical Science 170701 503
Principles of Health Science 170111 504
Principles of Veterinary Assisting 170801 505
Special Topics in Allied Health 170591 507
Veterinary Assisting Internship 170804 508
Veterinary Assisting Skills 170802 509
INFORMATION TECHNOLOGY 511
INFORMATION TECHNOLOGY PATHWAYS 512
Computer Programming CIP11.0201.01 512
Computer Programming Blended Hybrid CIP 11.0201.02 513
Computer Science CIP 11.0701.01 514
Cyber Engineering CIP 14.0902.00 515
Digital Design and Game Development CIP 36.0113.00 516
Informatics CIP 11.0802.00 517
Information Support and Services CIP 47.0104.01 518

Network Administration CIP 11.0901.01 519
Network Security CIP 11.1003.00 520
Web Development/Administration CIP 11.0801.01 521
INFORMATION TECHNOLOGY COURSES 522
Accessing the WAN/Connecting Networks/Cisco IV 110905 522
Advanced 3D Game Development 113603 523
Advanced Game Development and Publishing 113602 524
AP Computer Science A 110701 526
AP Computer Science Principles 110711 527
App Development with Swift 110821 529
C# I 110214 530
C# II 110215 531
C++ I 110202 532
C++ II 110216 533
Computational Thinking 110251 534
Computer Hardware and Software Maintenance 110101 535
Computer Literacy 110110 536
Computer Science (NICERC) 110225 537
Computers, Networks, and Databases 111001 538
Cyber Literacy I (NICERC) 110222 539
Cyber Literacy II (NICERC) 110223 540
Cyber Science (NICERC) 110224 541
Cybersecurity (PLTW) 110230 542
Databases in the Cloud 111003 543
Design for the Digital World 111002 544
Design for the Internet 110213 545
Developing a Cloud Presence 111004 546
Digital 3D Graphics and Special Effects II 113604 547
Digital Literacy 060112 548
Flash with Action Script 110810 550
Game Design and Development Principles 113605 551
Help Desk Operations 110102 553
Information Technology Co-Op 110918 554
Information Technology Internship 110919 555

Internet Technologies 110917 556
Introduction to Computer Science 110710 557
Introduction to Database Design 110211 559
Introduction to Digital Game Graphics 113601 560
Introduction to Networking Concepts (non-vendor) 110901 562
Introduction to Programming 110201 563
JAVA Programming I 110205 564
JAVA Programming II 110206 565
JavaScript 110809 566
LAN Switching and Wireless/Scaling Networks/Cisco III 110904 567
Leadership Dynamics – Information Technology 110399 568
Management of Support Services 110302 569
Microsoft Active Directory Server 110907 570
Microsoft Client/Server Configuration 110913 571
Network Fundamentals/Cisco I 110902 572
Network Hardware Installation and Troubleshooting 110906 573
Perl I 110217 574
PHP I 110218 575
PHP II 110219 576
Productivity Software 110204 577
Project-Based Programming 110226 578
Python I 110220 579
Python II 110221 580
Routing Protocols and Concepts/Cisco II 110903 581
Security Fundamentals 110912 582
Special Topics, Computer Science 110752 583
Special Topics, Information Support and Services 110152 584
Special Topics, Networking 110952 585
Special Topics, Programming 110252 586
Special Topics, Web Development/Administration 110852 587
Visual Basic I 110207 588
Visual Basic II: Creating Desktop Applications 110208 589
Web Page Development 110801 590
Web Site Design and Production 110804 591

JROTC **592**
JROTC CAREER PATHWAYS 593
Air Force JROTC CIP 28.0101.00 593
Army JROTC CIP 28.0301.00 594
Marine Corps JROTC CIP 28.0401.02 595
Navy JROTC CIP 28.0401.01 596
JROTC Courses 597
Air Force JROTC 1 580134 597
Air Force JROTC 2 580135 599
Air Force JROTC 3 580136 601
Air Force JROTC 4 580137 603
Air Force JROTC Leadership 580138 605
Army JROTC 1 580240 607
Army JROTC 2 580241 608
Army JROTC 3 580242 610
Army JROTC 4 580243 612
Army JROTC Leadership 580244 614
Marine Corps JROTC 1 580320 616
Marine Corps JROTC 2 580321 618
Marine Corps JROTC 3 580322 620
Marine Corps JROTC 4 580323 622
Marine Corps JROTC Leadership 580324 624
Navy JROTC 1 580310 626
Navy JROTC 2 580311 627
Navy JROTC 3 580312 629
Navy JROTC 4 580313 631
Navy JROTC Leadership 580314 633
LAW AND PUBLIC SAFETY **635**
LAW, PUBLIC SAFETY, CORRECTIONS AND SECURITY CAREER PATHWAYS ... 636
Corrections CIP 43.0102.00 636
Homeland Security CIP 43.0301.00 637
Law Enforcement Services CIP 43.0107.00 638
Pre-Law Studies CIP 22.0001.00 639
LAW, PUBLIC SAFETY, CORRECTIONS AND SECURITY COURSES 640

Advanced Legal Practice 461047 640
Alternative Dispute Resolution 461048 641
Appellate Advocacy 461049 642
Basic Security Services 461042 643
Basic Telecommunications 461011 644
Civil Law and Procedure 461019 645
Constitutional Law and Civil Rights 461050 646
Co-op (Pre-Law) 461097 647
Co-op (Public Services/Protective Services) 461096 648
Correctional Systems 461037 649
Criminal Investigation 461043 650
Criminal Law and Procedure 461020 651
Critical Infrastructure Protection 461040 652
Emergency Management 461013 653
Health and Well-Being for Law Enforcement 461018 654
Internship (Pre-Law) 461095 655
Internship (Public Services/Protective Services) 461094 656
Introduction to Criminal Justice 461044 657
Introduction to Homeland Security 461038 658
Introduction to Law 461051 659
Law Enforcement 461045 660
Special Topics—Pre-Law 461098 661
Special Topics—Public Services/Protective Services 461099 662
Terrorism and Counterterrorism Operations 461039 663
Trial Advocacy 461052 664
FIRE SAFETY CAREER PATHWAYS 666
Emergency Medical Technology CIP 51.0904.01 666
Fire Science/Firefighting CIP 43.0203.00 667
FIRE SAFETY COURSES 668
Company Officer Development 461062 668
Co-Op (Fire Service/EMT) 461063 669
EMS Training 461023 670
EMT – First Responder 461022 672
Firefighting Advanced Skills I 461064 674

Firefighting Advanced Skills II 461065 678
Firefighting Basic Skills I 461032 681
Firefighting Basic Skills II 461034 685
Firefighting Basic Skills III 461031 693
Firefighting Intermediate Skills I 461036 696
Firefighting Intermediate Skills II 461066 700
Firefighting Intermediate Skills III 461067 703
Internship (Fire Service/EMT) 461068 706
Introduction to Fire Service 461033 707
Special Topics – Fire Service 461069 710
MANUFACTURING TECHNOLOGY EDUCATION 711
COMPUTER-AIDED DESIGN (CAD) CAREER PATHWAYS 712
Architectural Technology CIP 15.1301.03 712
Civil Designer CIP 15.1301.01 713
Manufacturing TRACK CIP 48.0500.99 714
Mechanical Designer CIP 15.1301.02 715
COMPUTER-AIDED DESIGN COURSES 716
Advanced Dimensioning and Measurement 470924 716
Architectural Design 480116 717
Construction Drafting (Techniques) 480119 718
Co-op I (CAD) 480142 719
Engineering Graphics 480113 720
Industrial Drafting Processes 480127 721
Intermediate Computer-Aided Drafting 480112 722
Internship (CAD) 480145 723
Introduction to Architecture 480117 724
Introduction to Computer-Aided Drafting 480110 725
Introduction to Surveying (For CAD) 480104 726
Mechanical Design 480135 727
Parametric Modeling 480136 728
Special Problems (CAD) 480179 729
COMPUTERIZED MANUFACTURING and MACHINING CAREER PATHWAYS 730
Computer Numerical Control (CNC) Operator CIP 48.0503.04 730
Machinist Operator CIP 48.0503.02 731

Manufacturing TRACK CIP 48.0500.99 732
COMPUTERIZED MANUFACTURING and MACHINING COURSES 733
Advanced Dimensioning and Measurement 470924 733
Applied Machining I 470911 734
Applied Machining II 470912 735
Blueprint Reading for Machinists 470921 736
CAD/CAM/CNC 470925 738
Conversational Editing and Subroutines 470927 739
Co-op (Machine Tool) 470929 740
Fundamentals of Machine Tools – A 470913 741
Fundamentals of Machine Tools – B 470914 743
Interdisciplinary Geometry and Computer-Aided Drafting (CAD) 480114 744
Internship (Machine Tool) 470932 745
Intermediate Computer-Aided Drafting 480112 746
Introduction to Computer-Aided Drafting 480110 747
Introduction to Conversational Programming 470926 748
Manual Programming 470915 749
Mechanical Blueprint Reading 470922 750
Metrology/Control Charts 470928 751
Special Problems (CMM) 470979 752
INDUSTRIAL MAINTENANCE TECHNOLOGY CAREER PATHWAYS 753
Electrical Technician CIP 47.0303.02 753
Maintenance Machinist CIP 47.0303.03 754
Maintenance Mechanic CIP 47.0303.01 755
Manufacturing TRACK CIP 48.0500.99 756
Welding Maintenance Technician CIP 47.0303.06 757
INDUSTRIAL MAINTENANCE TECHNOLOGY COURSES 758
Advanced Hydraulic Systems 470316 758
Advanced Pneumatic Systems 470326 759
Applied Machining I (for Industrial Maint.) 470360 760
Basic Blueprint Reading 499920 761
Basic Troubleshooting 499925 762
Blueprint Reading for Machinists 470921 763
Cooling and Dehumidification (for Industrial Maint.) 470361 765

Co-op I (Ind Maint) 470305 767
Electrical Components (Ind. Maint.) 470358 768
Fluid Power 470321 770
Fundamentals of Machine Tools – A (For Maintenance) 470313 771
Fundamentals of Machine Tools – B (For Maintenance) 470314 773
Gas Metal Arc Welding 470367 774
Heating and Humidification (for Industrial Maint.) 470363 775
HVAC Electricity (Ind Maint) 470365 778
Industrial Maintenance Electrical Motor Controls 470348 779
Industrial Maintenance Electrical Principles 470322 780
Industrial Maintenance of PLC's 470330 781
Internship (Ind Maint) 470308 782
Maintaining Industrial Equipment 470318 783
Refrigeration Fundamentals (For Maintenance) 470349 785
Robotics and Automation (For Maintenance) 470351 787
Shielded Metal Arc Welding (For Maintenance) 470354 788
Shop Management 470301 789
Special Topics—Industrial Maintenance Technology 470336 790
Welding for Maintenance 470328 791
METAL FABRICATION CAREER PATHWAYS 792
Manufacturing TRACK CIP 48.0500.99 792
Sheet Metal Technician CIP 48.0506.01 793
METAL FABRICATION COURSES 794
Co-op I (Metal Fab) 480803 794
Co-op II (Metal Fab) 480804 795
Co-op III (Metal Fab) 480805 796
Internship (Metal Fab) 480806 797
Metal Trade Information and Metals 480816 798
Parallel Line Layout 480813 799
Radial Line Development 480814 800
Sheet Metal I – A 480817 801
Sheet Metal I – B 480818 802
Sheet Metal II – A 480819 804
Sheet Metal II – B 480820 805

Special Projects I (Metal Fab) 480879 ... 806
WELDING TECHNOLOGY CAREER PATHWAYS ... 807
Manufacturing TRACK CIP 48.0500.99 ... 807
Skilled Trades Welding TRACK CIP 48.0508.99 ... 808
Welder-Entry Level CIP 48.0508.01 ... 809
WELDING TECHNOLOGY COURSES ... 810
Basic Blueprint Reading 499920 ... 810
Basic Welding 480524 ... 811
Blueprint Reading for Welding 480505 ... 812
Co-op I (Welding) 480541 ... 813
Cutting Processes 480501 ... 814
Gas Metal Arc Welding 480522 ... 815
Gas Tungsten Arc Welding 480525 ... 816
Gas Tungsten Arc Welding Pipe Lab A 480538 ... 817
GMAW Aluminum Lab 480534 ... 818
GMAW Groove Lab 480533 ... 819
GMAW Pipe Lab A 480540 ... 820
GTAW Groove Lab 480530 ... 821
Internship (Welding) 480544 ... 822
Oxy-Fuel Systems 480523 ... 823
Shielded Metal Arc Welding (SMAW) 480521 ... 824
Shielded Metal Arc Welding Pipe Lab A 480536 ... 825
Shielded Metal Arc Welding Pipe Lab B 480537 ... 826
SMAW Groove Welds with Backing Lab 480528 ... 827
SMAW Open Groove Lab 480535 ... 828
Special Problems (Welding) 480595 ... 829
Welding Certification 480507 ... 830
WOOD MANUFACTURING CAREER PATHWAYS ... 831
Manufacturing TRACK CIP 48.0500.99 ... 831
Wood Manufacturing CIP 48.0703.02 ... 832
WOOD MANUFACTURING COURSES ... 833
Advanced Wood Processing 480733 ... 833
Cabinet Making Technology 480731 ... 834
CAD for Wood Technology 480725 ... 836

Co-op I (Wood) 480741 ... 837
Furniture Technology 480721 ... 838
Internship (Wood) 480744 ... 840
Introduction to Computer-Aided Drafting 480110 ... 841
Introduction to Panel Processing 480711 ... 842
Lumber Grading and Drying 480716 ... 843
Millwork Technology 480717 ... 845
Special Problems (Wood) 480795 ... 846
Technical Drawing and Blueprint Reading 480719 ... 847
Wood Finishing 480720 ... 848
Wood Product Manufacturing 480740 ... 849
MANUFACTURING-ENGINEERING HYBRID CAREER PATHWAYS ... 850
Computerized Manufacturing and Machining (CMM) Engineering CIP 48.0510.00 ... 850
Design Engineering CIP 15.1304.00 ... 851
Fabrication Engineering CIP 14.1901.00 ... 852
Industrial Maintenance Engineering CIP 14.4101.00 ... 853
Welding Engineer CIP 15.0614.00 ... 854
Wood Manufacturing Engineering CIP 03.0509.00 ... 855
MEDIA ARTS ... 856
MEDIA ARTS CAREER PATHWAYS ... 857
Cinematography and Video Production CIP 09.0701.00 ... 857
Graphic Design CIP 50.0401.00 ... 858
Interactive Media CIP 10.0304.00 ... 859
MEDIA ARTS COURSES ... 860
Advanced Production Design 480922 ... 860
Advanced Studio Production - Moving Images 480912 ... 862
Digital Imaging 480921 ... 864
Interactive Design 480902 ... 866
Introduction to Media Arts 480901 ... 867
Media Arts Co-op 480950 ... 868
Media Arts Internship 480951 ... 869
Moving Image Animation 480903 ... 870
Studio Directing and Performance 480911 ... 871
Two-Dimensional Media Design 480920 ... 873

Video Studio Fundamentals 480910 875
Virtual Design 480904 878
TRANSPORTATION EDUCATION 881
AUTOMOTIVE EDUCATION CAREER PATHWAYS 882
Automotive Maintenance and Light Repair Technician CIP 47.0604.01 882
Automobile Service Technician CIP 47.0604.02 883
Automotive Engineering CIP 15.0803.00 884
AUTOMOTIVE EDUCATION COURSES 885
Automobile Service Technology Section A 470515 885
Automobile Service Technology Section B 470517 893
Automobile Service Technology Section C 470519 894
Automobile Service Technology Section D 470521 895
Automotive Internship I 470504 896
Automotive Maintenance and Light Repair Section A 470507 897
Automotive Maintenance and Light Repair Section B 470509 904
Automotive Maintenance and Light Repair Section C 470511 905
Automotive Maintenance and Light Repair Section D 470513 906
Basic Automotive Electricity 470556 907
Co-op I (Auto) 470501 908
Industrial Safety 499930 909
Light Vehicle Diesel Engines Section A 470527 910
Light Vehicle Diesel Engines Section B 470528 915
Light Vehicle Diesel Engines Section C 470529 916
Light Vehicle Diesel Engines Section D 470530 917
Master Automobile Service Technology Section A 470523 918
Master Automobile Service Technology Section B 470525 923
Precision Measurement 470546 924
Shop Management 470301 925
Special Problems I (Auto) 470577 926
Special Problems II (Auto) 470578 927
Special Problems III (Auto) 470579 928
Special Problems IV (Auto) 470584 929
COLLISION REPAIR TECHNOLOGY CAREER PATHWAYS 930
Entry Level Collision Repair Painter CIP 47.0603.01 930

Entry Level Non-Structural Damage and Repair Technician CIP 47.0603.03 931
COLLISION REPAIR TECHNOLOGY COURSES 932
Collision Repair Internship I 470604 932
Damage Analysis, Estimating and Customer Service 470628 933
Industrial Safety 499930 936
Introduction to Collision Repair 470631 937
Mechanical and Electrical Components I 470642 938
Mechanical and Electrical Components II 470653 942
Non-Structural Analysis and Damage and Repair Special Projects 470651 943
Non-Structural Analysis and Damage and Repair Special Projects Lab 470652 944
Non-Structural Analysis and Damage Repair I 470633 945
Non-Structural Analysis and Damage Repair II 470644 948
Non-Structural Analysis and Damage Repair III 470649 949
Painting and Refinishing I 470639 950
Painting and Refinishing II 470640 953
Painting and Refinishing III 470645 954
Painting and Refinishing Special Problems 470647 955
Special Projects I (Collision Repair) 470677 956
Special Projects II (Collision Repair) 470678 957
Special Projects III (Collision Repair) 470679 958
Structural Analysis and Damage Repair I 470620 959
Structural Analysis and Damage Repair II 470622 962
DIESEL/MEDIUM-HEAVY TRUCK TECHNOLOGY CAREER PATHWAYS 963
Diesel Brake Repairer CIP 47.0605.01 963
Diesel Engine/Electrician Technician CIP 47.0605.02 964
Diesel Front End Technician CIP 47.0605.03 965
Diesel Medium Heavy Truck Inspection, Maintenance, and Minor Repair Technician CIP 47.0605.07 966
Diesel Medium/Heavy Truck Service Technology Technician (TST) CIP 47.0605.08 967
Master Medium/Heavy Diesel Truck Service Technology (MTST) CIP 47.0605.09 968
DIESEL/MEDIUM-HEAVY TRUCK COURSES 969
Basic Automotive Electricity 470556 969
Brakes (Diesel) 470422 971
Climate Control (Diesel) and Lab 470438 974
Cooperative Education I 470442 977

Diesel Engine Repair 470423 978
Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section A 470450 980
Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section B 470451 988
Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section C 470452 989
Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section D 470453 990
Diesel Medium/Heavy Truck Service Technology (TST) Section A 470460 991
Diesel Medium/Heavy Truck Service Technology (TST) Section B 470461 999
Diesel Medium/Heavy Truck Service Technology (TST) Section C 470462 1000
Diesel Medium/Heavy Truck Service Technology (TST) Section D 470463 1001
Electrical Systems for Diesel Equipment 470425 1002
Hydraulics and Lab 470426 1005
Internship I (Diesel) 470445 1007
Introduction to Diesel Engines 470421 1008
Master Medium/Heavy Diesel Truck Service Technology (MTST) Section A 470470 .. 1011
Master Medium/Heavy Diesel Truck Service Technology (MTST) Section B 470471 .. 1018
Mechanical Concepts 470406 1019
Powertrain (Diesel) and Lab 470427 1020
Precision Measurement 470546 1024
Preventive Maintenance Lab 470403 1025
Special Problems I (Diesel) 470477 1030
Special Problems II (Diesel) 470478 1031
Special Problems III (Diesel) 470479 1032
Special Problems IV (Diesel) 470480 1033
Special Topics – Diesel Technology 470499 1034
Steering and Suspension (Diesel) 470424 1035

AGRICULTURAL EDUCATION

AGRICULTURAL EDUCATION CAREER PATHWAYS

Agribiotechnology Systems CIP 26.1200.00

Agribiotechnology focuses on the application of scientific principles and techniques to advance the agriculture industry. Focusing on animal and plant concepts, this pathway develops competency by analyzing current procedures in agriculture while synthesizing new ways of thinking. Microbiology, molecular biology enzymology and immunology procedures are centerpieces for determining how to feed an ever growing world population.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 030715 Principles of Agricultural Science and Technology
- 030711 Agriscience

Choose (2-3) two – three credits from the following:

- 030713 Agri-biology Interdisciplinary
- 020210 Agribiotechnology
- 020511 Veterinary Science
- 010702 Food Science and Technology
- 030609 Environmental Science and Technology

May substitute (1) one credit below for a pathway course:

- 020520 Aquaculture
- 010121 Agriculture Employability Skills
- 030790 Agricultural Education Co-op
- 030791 Agricultural Education Internship

Agribusiness Systems CIP 01.0101.00

Agribusiness systems contribute to the production, processing, marketing, distribution, financing and development of agricultural commodities and resources. This includes food, fiber, wood products, natural resources, horticulture and other plant and animal products and services. Agribusiness is a high-tech industry that uses satellite systems, computer databases and spreadsheets, biotechnology and many other innovations to increase efficiency and profitability.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 030715 Principles of Agricultural Science and Technology
- 030711 Agriscience

Choose (2-3) two – three credits from the following:

- 010131 Agribusiness and Farm Management
- 010121 Agriculture Employability Skills
- 010111 Agriculture Sales and Marketing
- 010110 Agriculture Communications

May substitute (1) one credit below for a pathway course:

- 010641 Greenhouse Technology
- 020503 Small Animal Technology
- 030790 Agricultural Education Co-op
- 030791 Agricultural Education Internship

Agricultural Power, Structural, Technical Systems CIP 01.0201.00

The Agricultural Power, Structural, Technical Systems pathway is built on the application of concepts in engineering, hydraulics, pneumatics, electronics, power, structures, and controls to the field of agriculture. Students design agricultural structures as well as machinery and equipment, while utilizing safe practices of operation and maintenance.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 030715 Principles of Agricultural Science and Technology
- 030711 Agriscience

Choose (2-3) two – three credits from the following:

- 010241 Agriculture Construction Skills
- 010231 Small Power and Equipment
- 010212 Agriculture Power and Machinery Operation
- 010211 Agriculture Structures and Designs

May substitute (1) one credit below for a pathway course:

- 010111 Agriculture Sales and Marketing
- 010121 Agriculture Employability Skills
- 010131 Agribusiness and Farm Management
- 030790 Agricultural Education Co-op
- 030791 Agricultural Education Internship

Animal Science Systems CIP 01.0901.00

This pathway focuses on the scientific principles that underline the breeding, care, and management of agricultural animals and the production, processing, and distribution of agricultural animal products. This includes developing better, more efficient ways of producing and processing meat, poultry, eggs and dairy products, as well as studying genetics, nutrition, reproduction, growth and development of animals.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 030715 Principles of Agricultural Science and Technology
- 030711 Agriscience

Choose (2-3) two – three credits from the following:

- 020501 Animal Science
- 020502 Animal Technology
- 020510 Equine Science
- 020503 Small Animal Technology
- 020511 Veterinary Science

May substitute (1) one credit below for a pathway course:

- 010702 Food Science and Technology
- 010701 Food Processing, Distribution and Marketing
- 020520 Aquaculture
- 010111 Agriculture Sales and Marketing
- 030713 Agri-biology Interdisciplinary
- 010131 Agribusiness and Farm Management
- 010121 Agriculture Employability Skills
- 030790 Agricultural Education Co-op
- 030791 Agricultural Education Internship

Environmental Science and Natural Resources Systems CIP 03.0101.00

This pathway focuses on the studies and activities relating to the natural environment and its conservation, use, and improvement. The basic principles of environmental science and natural resource management are the foundational concepts of this pathway. Subjects addressed include air, soil, water, wildlife, plants, and sources of energy. Instruction related to using these resources economically as well as recreationally is also included.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 030715 Principles of Agricultural Science and Technology
- 030711 Agriscience

Choose (2-3) two – three credits from the following:

- 030610 Forestry
- 030609 Environmental Science and Technology
- 030611 Wildlife Resources
- 020520 Aquaculture
- 010611 Introduction to Greenhouse and Crop Production
- 030713 Agri-biology Interdisciplinary

May substitute (1) one credit below for a pathway course:

- 010121 Agriculture Employability Skills
- 010111 Agriculture Sales and Marketing
- 010651 Nursery and Orchard Technology
- 010641 Greenhouse Technology
- 030790 Agricultural Education Co-op
- 030791 Agricultural Education Internship

Food Science and Processing Systems CIP 01.1001.00

This pathway focuses on the application of biological, chemical, and physical principles to the study of converting raw agricultural products into processed forms suitable for direct human consumption, and the storage of such products. Human health and safety related to food processing and consumption are continually addressed in this pathway.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 030715 Principles of Agricultural Science and Technology
- 030711 Agriscience

Choose (2-3) credits from the following:

- 030713 Agri-biology Interdisciplinary
- 010702 Food Science and Technology
- 010701 Food Processing, Distribution and Marketing
- 020210 Agribiotechnology

May substitute (1) one credit below for a pathway course:

- 020501 Animal Science
- 020520 Aquaculture
- 010111 Agriculture Sales and Marketing
- 010121 Agriculture Employability Skills
- 030790 Agricultural Education Co-op
- 030791 Agricultural Education Internship

Horticulture and Plant Science Systems CIP 01.1101.00

This pathway focuses on the scientific principles that underlie the breeding, cultivation, and production of agricultural plants, and the production, processing, and distribution of agricultural plant products. Includes instruction in the plant sciences, crop cultivation and production, and agricultural and food products processing.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 030715 Principles of Agricultural Science and Technology
- 030711 Agriscience

Choose (2-3) two – three credits from the following:

- 010611 Introduction to Greenhouse and Crop Production
- 010621 Floriculture and Floral Design
- 010641 Greenhouse Technology
- 010651 Nursery and Orchard Technology
- 010631 Landscape and Turf Management
- 010610 Crop Technology

May substitute (1) one credit below for a pathway course:

- 010131 Agribusiness and Farm Management
- 010121 Agriculture Employability Skills
- 010111 Agriculture Sales and Marketing
- 030713 Agri-biology Interdisciplinary
- 030790 Agricultural Education Co-op
- 030791 Agricultural Education Internship

AGRICULTURAL EDUCATION COURSES

Advanced Agricultural Economics and Agribusiness Management 010101

Describes the theories and principles of sound business and economics practices, including marketing, finance, record keeping, inventories, personal management, tax laws, labor management, and future trading.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Complete tasks as developed by the instructor related to the theories and principles of advanced agricultural economics and agribusiness management.

Agri-biology Interdisciplinary 030713

Agri-biology is a one-credit interdisciplinary course that meets the life science requirement for science credit. This course may count as one of the three required credits in science for high school graduation. Agri-biology uses agricultural contexts to present the required life science content for assessment as outlined in the program of studies. As students study practical agricultural concepts, they apply scientific ways of thinking and working to real-life problems. The agriculture teacher and science teacher work together in planning and evaluating the course. Content may be enhanced by utilizing appropriate technology. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Investigate how cell structure, function and processes affect living things.
2. Examine the molecular basis of heredity.
3. Explore how DNA (deoxyribonucleic acid) affects organisms' morphology and physiology.
4. Analyze how behavioral patterns ensure reproductive success.
5. Recognize how agriculturalists manipulate reproductive success.
6. Examine the processes of biological change.
7. Investigate how agricultural crops and animals reflect diversity in nature.
8. Explore interdependence of organisms within ecosystems.
9. Analyze the alteration of ecosystems by agricultural processes.
10. Differentiate between croplands and natural ecosystems.
11. Recognize how organ systems work together to keep animals healthy.
12. Demonstrate employability and soft skills relative to the career cluster.
13. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
14. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.

Agribiotechnology 020210

Biotechnology in agriculture is designed to emphasize the interrelationship of science and technology and the impact of this technology on agriculture and agricultural products. The curriculum includes: career opportunities in the agricultural biotechnology industry; basic concepts about biotechnology; how genetic information is transferred and changed by engineering; opportunities, impacts, and public issues concerning biotechnology; the processes and applications of biotechnology in plant and animal science; and the applications of microbial biotechnology in agriculture. Content will be enhanced with appropriate applied science laboratory activities and computer applications. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Investigate basic concepts about biotechnology in agriculture.
2. Analyze how genetic information is transferred and changed.
3. Debate opportunities, impacts, and public issues concerning biotechnology.
4. Investigate the processes and applications of biotechnology in plant science.
5. Investigate the processes and applications of biotechnology in animal science.
6. Investigate the applications of microbial biotechnology in agriculture.
7. Demonstrate employability and soft skills relative to the career cluster.
8. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
9. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
10. Apply science, math and communication skills within the technical content.

Agribusiness and Farm Management 010131

This course introduces the free enterprise system, the study of economic principles, risk management, business law, budgets, finance, recordkeeping, and careers in agribusiness. Basic skills will be developed to manage a farm or agribusiness. Content will include: managing production and inventory, equipment, credit and taxes, market analysis and developing a business plan. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Relate economic principles to agribusiness and farm management.
2. Evaluate record keeping systems and procedures in agribusiness or farming.
3. Investigate sources of capital for agriculture.
4. Relate government policies and business law to agriculture.
5. Identify agribusiness functions critical to success with minimizing risk.
6. Prepare budgets determining financial needs, costs, and loan repayments.
7. Analyze inventories to asset values, net worth, efficiency and production.
8. Explore marketing options available to agricultural products.
9. Plan marketing strategies for agriculture products.
10. Manage human resources in agriculture.
11. Discuss GPS (global positioning systems) and their influence on agriculture.
12. Demonstrate employability and soft skills relative to the career cluster.
13. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
14. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
15. Apply science, math and communication skills within the technical content.

Agricultural Education Co-op 030790

Cooperative Education for CTE (Career and Technical Education) courses provides supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved pathway course during the same school year that the co-op experience is completed or have already completed the pathway the previous year. Students who participate receive a salary for these experiences, in accordance with local, state and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 - 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Agricultural Education Internship 030791

Internship for CTE (Career and Technical Education) courses provides supervised work-site experience for high school students who are enrolled in a pathway course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester or longer and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less). All information referenced to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 - 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Agriculture Communications 010110

This course develops an understanding of fundamental skills necessary to be successful in the agricultural communications industry. Provides guided practice and applied experience utilizing various styles of communication including oral, written, and electronic communications. Techniques of communications will include: traditional print media, brochure development, photography, videography, computer program applications, and internet usage including e-mail. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Develop skills in public, extemporaneous and impromptu speaking.
2. Communicate to resolve conflict and promote team building.
3. Perform computer skills related to word processing, publishing, presentations and computer graphics.
4. Develop skills related to proper telephone usage.
5. Develop skills to produce print quality newspaper and magazine articles.
6. Develop skills to produce brochures and sales ads.
7. Develop skills for photography and videography used in communications.
8. Utilize skills developed to produce radio and television ads and promotions.
9. Develop skills needed to produce multimedia presentations.
10. Utilize the Internet for research, e-mail, and basic communication processes.
11. Understand how non-verbal communication plays a part in interpersonal development.
12. Conduct meetings by using parliamentary procedures.
13. Learn to develop and complete professional quality resumes.
14. Learn techniques to assist in applying and interviewing for a job.
15. Demonstrate the ability to do market research and organization for presentations.
16. Plan, organize, and deliver a sales presentation.
17. Demonstrate employability and soft skills relative to the career cluster.
18. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
19. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
20. Apply science, math and communication skills with the technical content.

Agriculture Construction Skills 010241

This course prepares students to construct and maintain agricultural structures and equipment. Develops basic skills such as: tool identification, interpreting plans, calculating a bill of materials, electrification, carpentry, welding, metal fabrication, plumbing and masonry. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate safe practices specific to agriculture power, structural, and technical systems including PPE (Personal Protective Equipment), materials handling, and shop operation.
2. Outline power unit and equipment controls, startup and shut down procedures, and operation inspections using service manuals.
3. Demonstrate proper use of measurement and layout tools.
4. Select, maintain, and use hand/power tools in service, construction, and fabrication.
5. Construct and repair fencing, including wood, static wire, electrical wire, and other fencing materials.
6. Employ safe usage of electric arc welding techniques and machines.
7. Describe the steps in basic repair of a metal object such as welding, brazing, and riveting.
8. Identify kinds and characteristics of metal materials.
9. Distinguish welding processes, positions, materials preparation, and equipment work piece setup (beveling and grinding).
10. Calculate materials for concrete, brick, stone, or masonry units in agricultural construction.
11. Demonstrate the basic principles of electricity.
12. Select and utilize proper painting materials and tools.
13. Develop plans using scales and legends.
14. Prepare bills of materials to accompany plans and sketches.
15. Develop criteria for selecting materials based on cost, quantities, and characteristics for a specific project plan.
16. Apply basic principles of design, fabrication, and installation of agricultural structures.
17. Discuss the steps in constructing a project out of wood such as measuring, cutting, fastening, and finishing.
18. Determine proper insulation material and method for various tasks.
19. Relate the influence of agricultural mechanics industry on globalized production.
20. Identify the importance and use of computer-based systems in agriculture, food and natural resources.
21. Discuss types of renewable and non-renewable energy such as solar, wind, water, and fossil fuels.
22. Explain environmental impacts and sustainability of various energy sources such as coal, water, wind, and geothermal.
23. Demonstrate employability and social skills relative to the career cluster.

24. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
25. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.

Agriculture Employability Skills 010121

Agriculture Employability Skills provides opportunities to develop skills in: job searching, preparing resumes, writing letters of application, job interview, attitude, communicating effectively, human relations and accepting responsibilities. Content may be enhanced with appropriate computer applications. Leadership Development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Recommend entrepreneurship and business training opportunities for agriculture to the community.
2. Compare agricultural business organizations and regulations.
3. Practice interpersonal relationships and communications.
4. Improve individual and group management skills.
5. Manage records and information systems for agriculture.
6. Manage capital resource for agriculture.
7. Investigate employer and employee responsibility of employment.
8. Apply technology in agricultural employment industry.
9. Demonstrate employability and social skills relative to the career cluster.
10. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
11. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
12. Apply science, math and communication skills within the technical content.

Agriculture Math (CTE Credit) 030707
Agriculture Math (Math Credit) 030708

This course provides an introduction to agriculture math. Course material will include: number properties and operations, measurement, geometry, data analysis and probability, algebraic thinking, personal development, employee and employer responsibilities, records, files, purchasing materials, stocking, selling and business account procedures. Leadership development will be provided though FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
2. Relate mathematical number properties and operations to agricultural practices.
3. Utilize measurements in an agricultural setting.
4. Demonstrate geometric principles through using agricultural contexts and examples.
5. Develop mathematical formulations relating to agricultural cash flows, budgeting, and farm management.
6. Formulate and apply statistical analyses to agricultural practices.
7. Investigate how algebraic thinking and formulations are beneficial to agriculture production.
8. Demonstrate employability and social skills relative to the career cluster.
9. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
10. Apply science, math and communication skills within the technical content.

Agriculture Power and Machinery Operation 010212

This course provides instruction and hands-on experience in basic principles of agricultural machinery assembly, operation, maintenance, service repair and safety. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate safe practice specific to the agriculture power, structural, and technical systems including PPE (Personal Protective Equipment), materials handling, and shop operation.
2. Identify the influence of agricultural mechanics industry on globalized production.
3. Identify the importance and use of computer-based systems in agriculture, food, and natural resources (web based service information, software diagnostics).
4. Discuss types of renewable and non-renewable energy such as solar, wind, water, and fossil fuels.
5. Explain environmental impacts and sustainability of various energy sources such as coal, water, wind, and geothermal.
6. Differentiate between the operation of gasoline and diesel engines.
7. Relate basic engine parts, as they pertain to carburation, compression, and ignition, to principles and operations of an engine.
8. Evaluate the importance of adjusting equipment including belts, drives, chains, and sprockets and maintenance of fluid conveyance components including hoses, lines, and nozzles.
9. Maintain hydraulic and pneumatic systems.
10. Outline power unit and equipment controls, startup and shut down procedures, and pre-operation inspections using service manuals.
11. Select lubricants based on viscosity, source, and equipment compatibility.
12. Establish a preventative maintenance schedule for power units and equipment such as lubricants, fluids, and filters.
13. Assess an internal combustion engine to determine service and repair of basic ignition, fuel, and compression.
14. Discuss the importance and function of safety systems on tools and equipment.
15. Demonstrate use of geospatial technologies as they relate to agriculture.
16. Demonstrate employability and social skills relative to the career cluster.
17. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
18. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.

Agriculture Sales and Marketing 010111

This course provides an introduction to agricultural sales and marketing. Course material will include: competition in the agriculture market place, marketing decisions, types of markets, contracting, government programs and regulations, personal development, employee and employer responsibilities, communications, promotion strategies, records, files, purchasing materials, stocking, selling, and business account procedures. Content may be enhanced with appropriate computer applications. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Relate interpersonal skills to success in agricultural sales and marketing.
2. Demonstrate effective verbal and written communications skills in agricultural sales and marketing.
3. Dramatize effective salesmanship techniques in agricultural sales and marketing.
4. Advertise and promote agricultural products.
5. Explore marketing options for agricultural products.
6. Utilize agricultural business procedures and record keeping.
7. Formulate a marketing plan for agricultural products.
8. Utilize technology in agricultural sales and marketing.
9. Demonstrate employability and social skills relative to the career cluster.
10. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
11. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
12. Apply science, math and communication skills within the technical content.

Agriculture Structures and Designs 010211

This course prepares students to evaluate, design and construct agricultural structures. Students learn to design, evaluate and interpret construction plans and calculate a bill of materials. The skills learned in the Agricultural Construction Skills course may be incorporated to construct an agricultural structure. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have an agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Identify and utilize tools, techniques, and formulas most appropriate for specific tasks or projects.
2. Discuss types of renewable and non-renewable energy including solar, wind, water, and fossil fuels.
3. Demonstrate safe practices specific to agriculture power, structural, and technical systems including PPE (Personal Protective Equipment), materials handling, and shop operation.
4. Demonstrate proper use of measurement and layout tools.
5. Develop plans using scale and legends.
6. Prepare bills of materials to accompany plans and sketches for tasks or projects such as wood structures, painting, fencing, and concrete.
7. Develop criteria for selecting materials based on cost, quantities, and characteristics for a specific project plan such as wood structures, painting, fencing, and concrete.
8. Apply basic principles of design, fabrication, and installation of agricultural structures.
9. Discuss the steps in constructing a project out of wood such as measuring, cutting, fastening, and finishing.
10. Calculate areas and volumes for coatings (paints, stains, varnishes) and determine proper coating material method for various tasks.
11. Determine proper insulation material and use for a given task.
12. Construct and repair fencing, including wood, static wire, and electrical wire.
13. Identify materials and tools used in electrical installation including wiring, fixtures, breakers, fuses, and conduit.
14. Utilize the *National Electric Code* and local codes in installation of electrical components.
15. Interpret basic electrical components, symbols, and diagrams including wiring, switches, receptacles, and duplexes.
16. Evaluate concepts and principles of geospatial technologies.
17. Describe equipment and processes used in geospatial technologies.
18. Relate the influence of agricultural mechanics industry to globalized production.
19. Demonstrate employability and social skills relative to the career cluster.
20. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
21. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.

Agriscience (CTE Credit) 030711
Agriscience (Science Credit) 030712

Agriscience introduces the scientific agricultural approach to animal science and selection, and plant and land science. Agricultural career opportunities will be emphasized in each class. Laboratory experiences relating to basic and current technology will be part of the program. Content may be enhanced by utilizing appropriate computer applications. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program and keep appropriate records.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Apply basic chemical and biological concepts to the production of food, including the interrelationships between soil and plants and the natural cycles which sustain all ecosystems.
2. Apply basic physiological and genetic principles to animal production systems.
3. Investigate the impact of human activities on the environment and resource conservation and stewardship and interpret the impact of globalization on agriculture.
4. Examine the application of technology and genetic engineering in modern agriculture systems.
5. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
6. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
7. Apply science, math, and communication skills with the technical content.
8. Demonstrate employability and social skills relative to the career cluster.

Animal Science 020501

Animal Science develops basic knowledge and skills pertaining to animal identification, selection, nutrition, reproduction and genetics, health management, and marketing of farm and companion animals commonly produced in Kentucky. The latest production technologies, as well as biotechnological applications, will be included. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Connect the benefits of animal agriculture to human kind; locally, nationally, and globally.
2. Interpret proper animal science terminology for livestock and companion animals.
3. Interpret proper terminology for the food animal industry.
4. Differentiate the common food animal species and their specific breeds.
5. Select and evaluate food animal livestock species according to current industry standards.
6. Apply principles of reproduction to food animal production.
7. Apply principles of digestion to food animal production.
8. Formulate livestock feeding programs that meet nutritional requirements.
9. Identify common animal health problems.
10. Synthesize their prevention/solution.
11. Investigate biotechnology principles in relation to the livestock industry.
12. Analyze the effect of animal agriculture and the environment.
13. Demonstrate employability and social skills relative to a career in animal sciences.
14. Maintain records on a supervised agricultural experience program and be able to summarize/analyze results for making financial decisions.
15. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.

Animal Technology 020502

Animal Technology instruction concentrates on the advanced production practices and current biotechnological applications of one or more species of farm animals, based on the local community needs. Laboratory experience will be used to emphasize concepts. Content may be enhanced by utilizing current industry accepted technology. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design animal breeding programs that employ the latest reproductive system manipulation techniques.
2. Design animal feeding programs that employ the latest nutrition principles and trends.
3. Construct a herd health program for common food animal species.
4. Demonstrate industry-accepted techniques for common herd health practices.
5. Demonstrate common veterinary best management practices for food animals.
6. Assess the end product of livestock production (meat and milk).
7. Analyze common animal husbandry practice to discern the scientific merit behind them.
8. Formulate an environmentally responsible waste management program for specific livestock production.
9. Demonstrate employability and social skills relative to a career in animal sciences.
10. Maintain records on a supervised agricultural experience program and be able to analyze results for making financial decisions.
11. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.

Aquaculture 020520

Instruction provides the fundamentals of aquatic plant and animal biology, anatomy, morphology and physiology in aquaculture, and the unique properties of water for aquaculture. Fish and aquatic crop production principles, management, and marketing are also included. Applications of biotechnology in aquaculture and aquaculture as sustainable agriculture is also included. Content will be enhanced with appropriate applied scientific laboratory activities. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 - 1

Students will:

1. Relate the fundamentals of aquatic plant and animal biology to production.
2. Analyze the unique chemical properties of water for aquaculture.
3. Demonstrate principles of aquaculture crop production from species selection to seed production to harvesting to processing.
4. Describe the components of managing the aquaculture facility and the marketing of crops produced.
5. Demonstrate applications of biotechnology in aquaculture.
6. Evaluate aquaculture as sustainable agriculture.
7. Demonstrate employability and social skills relative to the career cluster.
8. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
9. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
10. Apply science, math, and communication skills within the technical content.

Crop Technology 010610

Crop Technology instruction concentrates on the production practices and current biotechnological applications of one or more agriculture crops. Hands-on experiences will be emphasized. Instruction will include variety selection, seed bed preparation, fertilization, pest, weed and disease control, harvesting, and marketing crops. Current biotechnological applications may be included. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have an agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Specify the benefit of crop production in local, national, and world agriculture.
2. Relate the economic factors of crop production in local, national, and world agriculture.
3. Evaluate environmental factors of crop production in local, national, and world agriculture.
4. Determine the impact of soil and water resources on crop production.
5. Demonstrate ability to read and utilize seed tag.
6. Utilize management practices in row crops.
7. Utilize management practices in small grains.
8. Utilize management practices in forages and pastures.
9. Relate biotechnology to land production.
10. Identify common agronomic plants, weeds, grains, feeds and seeds.
11. Demonstrate an understanding of agricultural law.
12. Demonstrate employability and social skills relative to the career cluster.
13. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
14. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
15. Apply science, math, and communication skills within the technical content.

Environmental Science and Technology 030609

This course is an intermediate scientific study of environmental technology. It is designed to develop an awareness of environmental concerns related to air, water, soil, land use management, waste management, and their interrelationship with the biological ecosystem. Soil formation, conservation, and evaluation material will also be included. Content will be enhanced with appropriate scientific laboratory activities, field experimentation, community development projects, and occupational development. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have an agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Distinguish the importance of conserving and managing our natural resources to maintain a high standard of living.
2. Investigate the various types of ecosystems and management skills for a productive life cycle.
3. Relate the physical properties of soil and its effect to the different aspects of the environment.
4. Relate environmental issues to the management of waste products.
5. Investigate the effects of land use and environmental legislation in multiple use planning.
6. Relate the proper handling, application, and disposal of chemicals to protection of the environmental balance.
7. Analyze the importance of air and water quality on society to ensure and improve sustainable standards.
8. Demonstrate employability and social skills relative to the career cluster.
9. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
10. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
11. Apply science, math, and communication skills within the technical content.

Equine Science 020510

Equine Science develops knowledge and skill pertaining to breed identification and selection, anatomy, physiology, nutrition, genetics and reproductive management, training principles, grooming, health disease, parasite control, and sanitation practices. Content may be enhanced with appropriate computer applications. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have an agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 - 1

Students will:

1. Relate the benefits of the equine industry to humankind in local, national, and world agriculture.
2. Interpret proper equine science terminology and terminology of the equine science industry.
3. Contrast equine anatomy, physiology, and purposes of different breeds.
4. Relate the anatomy and physiology of the equine digestive system to proper nutritional practices.
5. Apply principles of health management and sanitation practices to the equine industry.
6. Demonstrate proper grooming and handling techniques in the equine industry.
7. Evaluate the role of equine domestication and the various types of equine in the world today.
8. Identify and utilize proper equine tack and equipment.
9. Identify the anatomy and physiology of the equine reproduction system and utilize proper breeding techniques.
10. Contrast horsemanship, showmanship, and training practices in the equine industry.
11. Compare and contrast various types of equine facilities and materials.
12. Relate equine agriculture to the environment.
13. Select and evaluate various types of equine.
14. Demonstrate employability and social skills relative to the career cluster.
15. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
16. Investigate biotechnological principles to the equine industry.
17. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.

Floriculture and Floral Design 010621

Floriculture and Floral Design provides instruction to develop floral design techniques using silk, dried, and fresh flowers. Students will learn operation and management techniques of a floral business as well as identification, production, and cultural maintenance practices of plants used in floral design and interior landscaping. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 - 1

Students will:

1. Relate floriculture practices to environmental impact.
2. Determine principles of design and elements of art in flower arranging.
3. Implement design skills in real-world connections.
4. Incorporate special techniques, such as bows, cards, wiring, and tinting, into floral design.
5. Demonstrate techniques in conditioning and maintaining flowers and floral design materials.
6. Maintain industry related equipment and materials.
7. Apply safety regulations and practices.
8. Identify common plant species, diseases, and floral tools.
9. Incorporate the color wheel and color schemes into floral designs.
10. Formulate a marketing plan.
11. Apply principles of interior landscaping.
12. Demonstrate employability and social skills relative to the career cluster.
13. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
14. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
15. Apply science, math, and communication skills within the technical content.

Food Processing, Distribution, and Marketing 010701

Food Processing, Distribution, and Marketing involves gaining knowledge in the production of food products from farm level to the consumer with emphasis on distribution and marketing to a global society. Potential marketing avenues and advertising of processed products along with current world food production issues will be examined. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 - 1

Students will:

1. Determine trends in world and U.S. food production.
2. Explore preservation methods such as curing, canning, and pasteurization of foods.
3. Investigate methods of reducing food pathogens and improving food quality during processing.
4. Examine food chemistry and physics as related to the formation of food products and the relationship of nutrients in food development.
5. Demonstrate the ability to produce a nutrition fact label for a processed product.
6. Recognize the relationship of biotechnology and science in food production.
7. Identify global distribution trends of food consumption patterns of various regions of the world.
8. Advertise and promote processed food products.
9. Explore marketing options for food products on an international spectrum.
10. Formulate a marketing plan for processed products.
11. Demonstrate employability and social skills relative to the career cluster.
12. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
13. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
14. Apply science, math, and communication skills within the technical content.

Food Science and Technology 010702

Food Science and Technology introduces the issues of food production, nutrition, food chemistry and the development of food products in a global society. The government regulations regarding foods and the exploration of career opportunities will also be covered. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Determine trends in world and U.S. food production.
2. Relate the food industry to the consumer, including food labeling and economics.
3. Investigate food safety issues from farm to retail, including microbial problems, risk assessment, food handling, and HAACP (Hazard Analysis and Critical Control Points) concepts.
4. Compare nutrient components of different food products and their effects on consumer's health and digestion.
5. Investigate food physics as related to the production of products in the industry.
6. Explore inspection, slaughter, and fabrication, preservation, and distribution aspects of the red meat industry.
7. Investigate the poultry industry from meat to egg and how it impacts current food trends.
8. Investigate production methods of marketing of dairy food products.
9. Explore the small grains products, fruits, and vegetables that currently play a role in food production.
10. Demonstrate employability and social skills relative to the career cluster.
11. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
12. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
13. Apply science, math, and communication skills within the technical content.

Forestry 030610

This course introduces the science of silviculture. The course includes career opportunities, tree identification, tree production, forestry management, timber harvesting, wood utilization, and the environmental and ecological aspects of forestry. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 - 1

Students will:

1. Utilize forestry tools and equipment.
2. Survey land and cruise timber.
3. Investigate physical characteristics of trees, plant processes, growth, and taxonomy.
4. Recommend management practices including genetic potential, reforestation, timber stand improvement, and harvesting.
5. Investigate environmental, social, and economic value of forest.
6. Investigate the influence and importance of forestry from local to global level.
7. Distinguish wood characteristics including wood properties, products, wood identification, and physiology.
8. Evaluate methods for forest protection from insect, disease, and other destructive agents.
9. Demonstrate employability and social skills relative to the career cluster.
10. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
11. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
12. Apply science, math, and communication skills within the technical content.

Greenhouse Technology 010641

Greenhouse Technology provides instruction in greenhouse structures and greenhouse environment regulations. Plant growth and development and propagation are included as well as production and maintenance of bedding and container produced plants. Fundamental principles of vegetable production and commercial production of vegetable crops as well as marketing of horticulture products may be included. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Propose greenhouse structural designs and equipment.
2. Manipulate greenhouse environmental conditions.
3. Prepare soils and planting media.
4. Investigate plant processes and development.
5. Select plant propagation methods.
6. Implement bedding and vegetable crop production and management strategies.
7. Formulate marketing plan for greenhouse plants and vegetable crops.
8. Demonstrate business and marketing procedures.
9. Maintain, operate, and repair facilities and equipment.
10. Develop and implement an integrated pest management plan.
11. Apply safety regulations and practices.
12. Demonstrate employability and social skills relative to the career cluster.
13. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
14. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
15. Apply science, math, and communication skills within the technical content.

Introduction to Greenhouse and Crop Production 010611

Introduction to Greenhouse and Crop Production develops basic scientific knowledge and skills pertaining to management of soil and its effects on human and animal food and fiber production, the environment, and meeting basic needs of life. The relationship of soil to plant growth and horticulture will be emphasized. Plant anatomy, reproduction, growth, health, and current biotechnological advances will be included. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Assess the benefit of plants and soils to human and animal life in Kentucky, national, and world agriculture.
2. Analyze the physical properties of soil involved in plant and land use including site analysis, soil sampling, soil structure, and soil texture.
3. Critique the principles of good land management including land capability, conservation measures, and limitations.
4. Connect the chemical properties of soil and water to plant and land use including pH, and soil fertility.
5. Identify essential nutrients for plant growth and select appropriate plant nutrition practices and management.
6. Examine the processes for plant development, growth, health, and reproduction.
7. Relate biotechnology to plant production.
8. Identify factors related to Integrated Pest Management (IPM) and develop solutions to disease and pest problems.
9. Illustrate and compare components of plant anatomy and explain the function of those parts including seeds and fruits.
10. Demonstrate employability and interpersonal skills relative to the career cluster.
11. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
12. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
13. Apply science, math, and communication skills within the technical content.

Landscape and Turf Management 010631

This course includes identification of landscape plants and their characteristics, site evaluation, site design, calculation of materials needed, costs for bidding, and installing landscape plans. Landscape plant maintenance will also be presented. Selection, culture, and management of turf species used for lawns, golf courses, athletic fields and erosion control may also be included. Content may be enhanced by utilizing appropriate technology. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Determine principles of design and elements of art in landscape design.
2. Select appropriate plants for design.
3. Calculate costs of landscape plans for installation.
4. Develop a plan for fertilizing landscape and turf areas.
5. Recommend site preparation and landscape plan installation.
6. Establish and maintain residential and commercial turf grass areas.
7. Formulate landscape and turf grass maintenance schedule.
8. Calculate landscape maintenance costs.
9. Understand how to maintain golf courses.
10. Demonstrate how to propagate and produce landscape plants.
11. Develop a plan for controlling pest and diseases.
12. Identify landscape plants and turf grass species.
13. Maintain, operate, and repair facilities and equipment.
14. Apply safety practices and regulations.
15. Demonstrate employability and social skills relative to the career cluster.
16. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
17. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
18. Apply science, math, and communication skills within the technical content.

Leadership Dynamics - Agriculture 030702

This course is designed to assist students with developing skills needed to be successful leaders and responsible members of society. The student will develop personal attributes and social skills. Emphasis will be placed on interpersonal skills, team building, communication, personal development, and leadership. This course will include opportunities for students to apply their knowledge.

This course **does not count** toward preparatory status.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 - 1

Students will:

1. Develop personal and group goals.
2. Compare the types of leadership styles.
3. Assess the importance of qualified leaders to the success of organizations.
4. Appraise personal characteristics of successful leaders.
5. Develop verbal and non-verbal communication skills to enhance success in school and transition to the world of work.
6. Demonstrate appropriate business and professional etiquette.
7. Demonstrate shared decision making.
8. Develop techniques to resolve conflicts that occur in school, home, community, and workplace (interpersonal team skills).
9. Demonstrate the use of parliamentary procedure skills in presiding over a meeting.
10. Describe how ethical and social behaviors affect our lives.
11. Identify self-management techniques.
12. Identify stress management techniques.
13. Analyze organizational structures and their components including bylaws, officers, committees, and program of work.
14. Demonstrate awareness of cultural diversity and equity issues.
15. Analyze leadership opportunities available in the school and community.

Nursery and Orchard Technology 010651

Nursery and Orchard Technology will provide instruction in production practices for container and field-grown nursery stock; identification, function, growing requirements, hardiness, problems and methods of different landscape plant materials; propagating and growing evergreens and deciduous plants; and the operation of garden centers and nurseries. Principles of home and commercial fruit production may also be included. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Investigate plant processes and plant development.
2. Demonstrate methods of plant propagation.
3. Prepare soils and planting media for nursery and orchard crops.
4. Implement production management strategies for nursery and orchard crops.
5. Relate nursery technology practices to environmental impact.
6. Demonstrate harvesting and merchandising of nursery and orchard crops.
7. Formulate marketing plan for nursery and orchard crops.
8. Design and construct growing structures.
9. Maintain, operate, and repair facilities and equipment.
10. Apply safety regulations and practices.
11. Demonstrate employability and social skills relative to the career cluster.
12. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
13. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
14. Apply science, math, and communication skills within the technical content.

Principles of Agricultural Science and Technology 030715

This course provides instruction in the foundations of various segments of the agricultural industry. Agricultural career opportunities will be emphasized. Animal science, plant and land science, and agricultural mechanics skills will be the focus of the curriculum. The selection and planning of a supervised agricultural experience program and related record keeping will be presented. Leadership development will be provided through FFA (Future Farmers of America). Students will receive personal guidance and counseling with preparatory instructional program selection.

Recommended Grade Level: 9

Recommended Credit: 1

Students will:

1. Develop a supervised agricultural experience program including use of record keeping.
2. Explore basic agricultural skills needed including math, communication, and employability skills.
3. Identify and examine general soil and plant sciences.
4. Identify and examine general animal sciences.
5. Demonstrate basic agricultural mechanics and construction skills.
6. Investigate basic environmental, food, and fiber interrelationships.
7. Demonstrate employability and social skills relative to the career cluster.
8. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
9. Participate in FFA (Future Farmers of America) leadership activities which are integrated into the course.

Small Animal Technology 020503

This course develops scientific knowledge, management practices, and marketing strategies in small and specialty animal technology. The curriculum includes identification, anatomy, physiology, nutrition, health, selection, and care of small animals. Species addressed typically include dogs, cats, rabbits, companion birds, ostriches, emus, tropical fish, and fur bearers. Content will be enhanced with appropriate applied scientific laboratory activities. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 - 1

Students will:

1. Relate small animal technology to current world trends.
2. Interpret proper specialty and small animal terminology and terminology of the industry.
3. Describe the distinguishing characteristics of the different breeds of small and specialty animal species.
4. Describe and compare the physiology and anatomy of small animal species.
5. Describe and compare the process of reproduction of small and specialty animal species.
6. Relate the anatomy and physiology of the digestive systems of small and specialty animals to proper nutritional practices.
7. Describe the care, handling, sheltering, and grooming of small and specialty animals.
8. Investigate both diseases and parasites and plan a health maintenance schedule in small and specialty animals.
9. Evaluate the management and marketing of small and specialty animal services and products.
10. Select and evaluate various breeds of small and specialty animals.
11. Relate small and specialty animal agriculture to the environment.
12. Investigate biotechnology principles to the small and specialty animal industry.
13. Demonstrate employability and social skills relative to the career cluster.
14. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
15. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.

Small Power and Equipment 010231

This course is designed to develop skills in maintenance, repair, and operation of equipment, small combustion-type engine and electric motors. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate safe practices specific to agriculture power, structural, and technical systems including PPE (Personal Protective Equipment), materials handling, and shop operation.
2. Compare the energy efficiency of various fuel sources such as gas, diesel, natural gas, and biofuels.
3. Differentiate between the operation of gasoline and diesel engines.
4. Identify principles of hydraulic and pneumatic system operation.
5. Identify basic small engine parts and principles of operations and their applications in agriculture.
6. Perform maintenance schedules and procedures for agricultural small engines.
7. Outline power unit and equipment controls, startup and shut down procedures, and pre-operation inspections using service manuals.
8. Use technical manuals and computer-based diagnostics in engine systems analysis and repair.
9. Assess an internal combustion engine to determine service and repair of basic ignition, fuel, and compression.
10. Assess malfunctioning electrical system components such as battery and lighting.
11. Determine small engine specifications using precision measuring equipment.
12. Service power transmissions.
13. Evaluate the importance of adjusting equipment including belts, drives, chains, and sprockets.
14. Maintain fluid conveyance components such as hoses, lines, and nozzles.
15. Demonstrate employability and social skills relative to the career cluster.
16. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
17. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
18. Apply science, math, and communication skills within the technical content.

Veterinary Science 020511

Veterinary science topics include safety, sanitation, anatomy and physiology, clinical exams, hospital procedures, parasitology, posology, laboratory techniques, nutrition, disease, office management, and animal management. Careers are also explored. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have an agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Examine proper safety and sanitation techniques when handling various animal species.
2. Discuss and explain multiple veterinary concepts and terminology.
3. Compare, examine, and identify the anatomy and physiology of various animal species using proper veterinary terminology.
4. Take part in clinical exams of an assortment of animal species.
5. Examine appropriate hospital procedures and discover ways to apply them to veterinary science practices.
6. Define and differentiate among the various parasites, their causes, symptoms, treatments, and the animal species that can be affected.
7. Discover how to utilize mathematical skills in the field of veterinary science.
8. Develop laboratory techniques and take part in activities and procedures to further assist with the various veterinary science concepts.
9. Define nutrient, list the nutrient groups, explain their functions, and explain how feed are balanced to meet nutrient requirements of animals.
10. Explain and discuss the principles of disease and evaluate how they affect numerous animal species.
11. Discuss appropriate animal management practices and how they relate to veterinary science.
12. Maintain records on supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
13. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
14. Apply science, math, and communication skills within the technical content.

Wildlife Resources 030611

Students develops an awareness of wildlife industry resources. This course includes: a study of ecology and ecosystems, wildlife habitat, population dynamics, management techniques that deal with wildlife in all areas, and the regulations that affect the wildlife industry. Content may be enhanced with appropriate applied scientific laboratory activities. Leadership development will be provided through FFA (Future Farmers of America). Each student will be expected to have a supervised agricultural experience program.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 - 1

Students will:

1. Analyze the dynamics of an ecosystem.
2. Examine the diverse components of habitat and its relation to wildlife.
3. Calculate the population dynamics that relate to wildlife.
4. Identify the human role in wildlife and habitat management as it applies to historic, social, political, and economic concerns.
5. Examine the human impact on wildlife resources.
6. Examine the federal and state laws and regulations that pertain to the conservation and preservation of wildlife.
7. Demonstrate employability and social skills relative to the career cluster.
8. Maintain records on a supervised agricultural experience program and be able to summarize and analyze results in making financial decisions.
9. Utilize activities of FFA (Future Farmers of America) as an integral component of course content and leadership development.
10. Apply science, math, and communication skills within the technical content.

BUSINESS AND MARKETING EDUCATION

BUSINESS AND MARKETING EDUCATION CAREER PATHWAYS

Accounting CIP 52.0301.00

This pathway generally prepares individuals to practice the profession of accounting and to perform related business functions. Includes instruction in accounting principles and theory; financial accounting; managerial accounting; cost accounting; budget control; tax accounting; legal aspects of accounting; auditing; reporting procedures; statement analysis; planning and consulting; business information systems; accounting research methods; professional standards and ethics; and applications to specific for-profit, public, and non-profit organizations.

BEST PRACTICE COURSES

Choose (2-3) two - three credits from the following:

- 060122 Accounting and Finance Foundations
- 070122 Financial Management
- 070125 Advanced Accounting

Choose (1-2) one - two credits from the following:

- 080719 Personal Finance (Math Credit)
- 060170 Personal Finance (CTE Credit)
- 060411 Introduction to Management
- 070750 Microsoft Office Specialist (MOS/MCAS)
- 060111 Business and Marketing Essentials
- 070743 Office Administration
- 060108 Business Education Internship
- 060107 Business Education Co-op
- 060112 Digital Literacy **OR** 110110 Computer Literacy
- 060109 Ethical Leadership

Administrative Support CIP 52.0401.00

This pathway is designed to provide students an advanced level experience that will propel them into the 21st century business world as they serve in positions such as college interns, administrative assistants, graduate assistants, and office managers. Instruction includes areas of fundamental business procedures, human resource management, time management software, workstation management, travel planning, financial reporting, payroll, mail procedures, effective communication skills, and ethical decision making skills.

BEST PRACTICE COURSES

Choose (3-4) three - four credits from the following:

- 060112 Digital Literacy **OR** 110110 Computer Literacy
- 060122 Accounting and Finance Foundations
- 070743 Office Administration
- 060155 Business Communications

Choose (1) one credit from the following:

- 070971 Medical Office
- 070750 Microsoft Office Specialist (MOS/MCAS)
- 070881 Legal Office
- 060111 Business and Marketing Essentials
- 170131 Medical Terminology (.5 – 1 credit)
- 170141 Emergency Procedures (.5 credit)
- 060108 Business Education Internship
- 060107 Business Education Co-op
- 080708 Marketing Education Internship
- 080707 Marketing Education Co-op
- 060109 Ethical Leadership

May substitute ONE credit below for Accounting and Finance Foundations course:

- 080719 Personal Finance (Math Credit)
- 060170 Personal Finance (CTE Credit)
- 070125 Advanced Accounting
- 070122 Financial Management
- 080772 Business Math (CTE Credit)
- 080780 Business Math (Math Credit)

Business Education TRACK CIP 52.0101.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from Business and Marketing Education Program of Studies. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide the student with a Business Education co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK Website.

E-Commerce CIP 52.0208.02

This pathway focuses on the creation, execution, transmission, and evaluation of commercial messages in various media intended to promote and sell products, services, and brands; and that prepares individuals to function as advertising assistants, technicians, and managers. Includes instruction in advertising theory; marketing strategy; advertising design and production methods; campaign methods and techniques; media management; related principles of business management; and applicable technical and equipment skills.

BEST PRACTICE COURSES

Choose (2-3) two - three credits from the following:

- 060112 Digital Literacy **OR** 110110 Computer Literacy
- 080716 Marketing Principles
- 081511 Advertising and Promotion
- 060751 Multimedia Publishing
- 060199 Web Page Design **OR** 081310 Fundamentals of Social Media Marketing

Choose (1-2) one - two credits from the following:

- 080310 Principles of Entrepreneurship
- 060111 Business and Marketing Essentials
- 080717 Marketing Applications
- 081411 Retail Marketing
- 060761 Advanced Multimedia Publishing
- 081512 Promotional Applications and Media
- 080708 Marketing Education Internship
- 080707 Marketing Education Co-op
- 060108 Business Education Internship
- 060107 Business Education Co-op
- 070750 Microsoft Office Specialist (MOS/MCAS)
- 060109 Ethical Leadership

Financial Services CIP 52.1908.00

This pathway prepares individuals to perform a wide variety of customer services in banks, insurance agencies, savings and loan companies, and related enterprises. Includes instruction in communications and public relations skills; business equipment operation; and technical skills applicable to the methods and operations of specific financial or insurance services.

BEST PRACTICE COURSES

Choose (3-4) three - four credits from the following:

- 080719 Personal Finance (Math Credit) **OR** 060170 Personal Finance (CTE Credit)
- 060311 Financial Services I
- 060122 Accounting and Finance Foundations
- 060301 Introduction to Finance

Choose (1-2) one - two credits from the following:

- 060351 Financial Services II
- 060111 Business and Marketing Essentials
- 060108 Business Education Internship
- 060107 Business Education Co-op
- 080708 Marketing Education Internship
- 080707 Marketing Education Co-op
- 080716 Marketing Principles
- 060399 Financial Analysis for Managers
- 070122 Financial Management
- 060109 Ethical Leadership

High School of Business CIP 52.0201.02

High School of Business™ brings college-inspired business administration courses to high schools across the U.S. An accelerated series of six courses challenges students with hands-on marketing, management, finance, and economics courses. Each course is built around industry-validated curriculum standards. The courses are positioned for local and national college credit opportunities as well as weighted scoring. Teachers receive high-quality professional development and ongoing support. At each participating school, a cross-functional steering team of local business leaders, college faculty, and school personnel manage the program. **THE HIGH SCHOOL OF BUSINESS COURSES MUST BE TAUGHT IN COURSE SEQUENCE AND REQUIRES AN AGREEMENT BETWEEN MBA RESEARCH AND THE LOCAL SCHOOL DISTRICT. EACH COURSE REQUIRES TEACHERS ATTEND TRAINING BEFORE IMPLEMENTATION.** Please refer to the link to High School of Business for further information.

BEST PRACTICE COURSES

- 060122 Accounting and Finance Foundations
- 080716 Marketing Principles
- 080310 Principles of Entrepreneurship
- 060111 Business and Marketing Essentials
- 060596 Business Economics (Economics Credit) **OR** 080317 Business Economics (CTE Credit)
- 070122 Financial Management
- 060411 Introduction to Management

Above courses are the course equivalents for the High School of Business (HSB) Courses as follows:

- HSB – Leadership equivalent to 080799 Leadership Dynamics
- HSB – Wealth Management equivalent to 060122 Accounting and Finance Foundations
- HSB – Principles of Business equivalent to 060111 Business and Marketing Essentials
- HSB – Business Economics equivalent to 060596 Business Economics (Economic Credit) **OR** 080317 Business Economics (CTE Credit)
- HSB – Principles of Marketing equivalent to 080716 Marketing Principles
- HSB – Principles of Finance equivalent to 070122 Financial Management
- HSB – Business Strategies equivalent to 080310 Principles of Entrepreneurship
- HSB – Principles of Management equivalent to 060411 Introduction to Management

Hospitality, Travel, Tourism and Recreation CIP 52.1910.00

The Hospitality, Travel, Tourism and Recreation career pathway prepares individuals to provide services in the hospitality and leisure fields. Includes instruction in hospitality operations; customer sales; marketing techniques; assistance operations and techniques; basic office management; sports, recreation and equipment management; and food and beverage services. The Hospitality, Travel, Tourism and Recreation career pathway is a hybrid pathway that consists of courses within Family Consumer Sciences Education and Marketing Education. It blends two program areas to help students explore technical skills in the industry.

BEST PRACTICE COURSES

Choose (3) three credits from the following:

- 080910 Principles of Hospitality **OR** 200610 Principles of Hospitality
- 080716 Marketing Principles
- 200641 Specialized Services in Hospitality
- 080717 Marketing Applications
- 080911 Travel and Tourism Marketing
- 200442 Advanced Foods and Nutrition

Choose (1) one credit from the following:

- 080310 Principles of Entrepreneurship
- 200441 Foods and Nutrition **OR** 200113 FACS Essentials
- 200601 Internship: Hospitality, Travel, Tourism and Recreation
- 200690 Co-op: Hospitality, Travel, Tourism and Recreation
- 080708 Marketing Education Internship
- 080707 Marketing Education Co-op
- 060109 Ethical Leadership

Informatics CIP 11.0802.00

Students will apply software systems such as Excel, Access, and other industry software to acquire, collect, store, and communicate data in meaningful ways to clients. Students will manage projects, work in teams, think critically, solve problems, and propose solutions to design problems. Further, they will learn to apply literacy, mathematics and science concepts, and use technology to effectively solve real-world, challenging problems. Through project-based learning, students will explore the future of informatics and learn those habits of behavior and mind unique to professionals in the field. Informatics leverages technology, data and communication by instilling in a new generation the knowledge, imagination, and flexibility to tackle complex issues successfully in a data-rich digital world. It is the process of designing systems that take raw data and convert it into new knowledge that can be applied to any field while considering the impact on individuals, organizations and society. **THE SOUTHERN REGION EDUCATION BOARD (SREB) INFORMATICS COURSES MUST BE TAUGHT IN THE FOUR COURSE SEQUENCE AND REQUIRE AN AGREEMENT BETWEEN SREB AND THE LOCAL SCHOOL DISTRICT. EACH COURSE REQUIRES TEACHERS ATTEND SUMMER TRAINING BEFORE IMPLEMENTATION.** Please see the link to SREB for further information.

BEST PRACTICE COURSES

Complete (4) four credits in the following:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 111001 Computer, Networks, and Databases
- 111002 Design for the Digital World
- 111003 Databases in the Cloud
- 111004 Developing a Cloud Presence
- 110918 Information Technology Co-op **OR** 110919 Information Technology Internship

Management and Entrepreneurship CIP 52.0701.00

This pathway generally prepares individuals to plan, organize, direct, and control the functions and processes of a firm or organization. Includes instruction in management theory, human resources management and behavior, accounting and other quantitative methods, purchasing and logistics, organization and production, marketing, and business decision making.

BEST PRACTICE COURSES

Choose (3-4) three - four credits from the following:

- 060111 Business and Marketing Essentials
- 060411 Introduction to Management
- 060122 Accounting and Finance Foundations
- 080310 Principles of Entrepreneurship

Choose (1-2) one - two credits from the following:

- 060112 Digital Literacy
- 110110 Computer Literacy
- 060596 Business Economics (Economics Credit) **OR** 080317 Business Economics (CTE Credit)
- 060108 Business Education Internship
- 060107 Business Education Co-op
- 080708 Marketing Education Internship
- 080707 Marketing Education Co-op
- 080716 Marketing Principles
- 070750 Microsoft Office Specialist (MOS/MCAS)
- 060109 Ethical Leadership

May substitute (1) one credit below for Accounting and Finance Foundations course:

- 070125 Advanced Accounting
- 080719 Personal Finance (Math Credit)
- 060170 Personal Finance (CTE Credit)
- 070122 Financial Management
- 080772 Business Math (CTE Credit)
- 080780 Business Math (Math Credit)

Marketing CIP 52.1401.01

This pathway generally prepares individuals to undertake and manage the process of developing consumer audiences and moving products from producers to consumers. Includes instruction in buyer behavior and dynamics, principle of marketing research, demand analysis, cost-volume and profit relationships, pricing theory, marketing campaign and strategic planning, market segments, advertising methods, sales operations and management, consumer relations, retailing and applications to specific products and markets.

BEST PRACTICE COURSES

Complete (2) two credits:

- 080716 Marketing Principles
- 080717 Marketing Applications

Choose (2) two credits from the following:

- 081511 Advertising and Promotion
- 081121 Sports and Event Marketing
- 080111 Fashion Marketing
- 081411 Retail Marketing
- 080310 Principles of Entrepreneurship
- 081512 Promotional Applications and Media
- 080911 Travel and Tourism Marketing
- 060122 Accounting and Finance Foundations
- 080719 Personal Finance (Math Credit) **OR** 060170 Personal Finance (CTE Credit)
- 060111 Business and Marketing Essentials
- 080708 Marketing Education Internship
- 080707 Marketing Education Co-op
- 060109 Ethical Leadership

Marketing Education TRACK CIP 52.1400.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from Business and Marketing Education Program of Studies. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide the student with a Marketing Education co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK Website.

Retail Services CIP 52.1803.00

This pathway generally prepares individuals to perform operations associated with retail sales in a variety of settings. Includes instruction in over-the-counter and other direct sales operations in business settings, basic bookkeeping principles, customer services, team/staff leadership and supervision, floor management, and applicable technical skills.

BEST PRACTICE COURSES

Choose (2–3) two – three credits from the following:

- 081411 Retail Marketing
- 080111 Fashion Marketing
- 081431 Retail Marketing Management **OR** 080717 Marketing Applications

Choose (1–2) one – two credits from the following:

- 080310 Principles of Entrepreneurship
- 080716 Marketing Principles
- 081512 Promotional Applications and Media
- 081511 Advertising and Promotion
- 081310 Fundamentals of Social Media
- 060122 Accounting and Finance Foundations **OR** 080719 Personal Finance (Math Credit) **OR** 060170 Personal Finance (CTE Credit)
- 080708 Marketing Education Internship
- 080707 Marketing Education Co-op
- 060109 Ethical Leadership

BUSINESS AND MARKETING EDUCATION COURSES

Accounting and Finance Foundations 060122

This course will provide an introduction to both areas of accounting and finance. Topics will include banking, credit, financial literacy, career exploration, spreadsheet usage, and technical writing. The major focus of the course is on the accounting cycle and the communication of financial information to decision-makers. The accounting principles taught in this course are based on a double-entry system and include preparing bank reconciliations, payroll taxes, and financial statements. Detailed career exploration in the various fields of accounting will be available. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Demonstrate financial calculations used by the business professional.
2. Research and analyze career opportunities in accounting and develop an employment portfolio including letter of application, resume, certificates of training, and samples of work.
3. Describe the purpose and function of accounting.
4. Examine the importance of work/business ethics.
5. Demonstrate employability and soft skills relative to the career cluster.
6. Research Internet safety and e-commerce regulations.
7. Assess the characteristics of money and the government's role in the economy.
8. Describe economic institutions such as banks and stock markets.
9. Identify banking procedures and apply correct accounting methods for all financial records.
10. Distinguish differences in business structures such as proprietorships, partnerships, and corporations.
11. Analyze and justify purpose for double-entry accounting.
12. Recognize and describe the effects of transactions on the elements of the accounting equation.
13. Apply the rules of debit and credit in recording transactions and recognize the normal account balance.
14. Explain accounting terms and concepts: automated accounting, accounting cycle, accounting framework, and account classifications.
15. Perform the basic steps in the accounting cycle for service and merchandising operations.
16. Apply the procedures used for special journals, controlling accounts and subsidiary ledgers.
17. Apply the principles of internal control, including petty cash procedures and bank reconciliation.
18. Apply the procedures for valuing and recording inventory.

19. Apply math, communication, and accounting skills in preparing and analyzing business transactions and financial statements through ratio analysis, break-even productivity, cost-benefit analysis, and time value of money.
20. Demonstrate the ability to create and analyze spreadsheets using Excel.
21. Calculate payroll earnings and payroll taxes, including but not limited to, FICA (Federal Insurance Compensation Act), Federal, FUTA (Federal Unemployment Tax Act), and SUTA (State Unemployment Tax Authority).
22. Determine and complete tax documents beginning with the W-4 through 1040EZ.
23. Develop an understanding of credit transactions including the laws that govern these functions.
24. Analyze business financial conditions through case studies.

Advanced Accounting 070125

This course uses an integrated approach to teach accounting. Students first learn how businesses plan for and evaluate their operating, financing, and investing decisions and how accounting systems gather and provide data to internal and external decision makers. This year-long course covers all the learning objectives of a traditional college level financial accounting course, plus those from a managerial accounting course. Topics include an introduction to accounting, accounting information systems, time value of money, accounting for merchandising firms, sales and receivables, fixed assets, debt, and equity. Other topics include statement of cash flows, financial ratios, cost-volume profit analysis, and variance analysis. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA. Teachers must go through a three-day training to teach this course.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Explain how and why the conceptual framework of accounting and generally accepted accounting principles provide guidance and structure for preparing financial statements.
2. Describe the information provided in each financial statement and how the statements articulate with each other.
3. Identify business ownership structures.
4. Explain the role of management and the auditor in preparing and issuing an annual report.
5. Identify and explain the classifications within assets, liabilities, and equity.
6. Define and calculate the current ratio, debt-equity ratio, return on sales, and return on equity.
7. Identify and explain the three phases of the management cycle and the four business processes.
8. Explain and calculate the operating cycle (accounts receivable turnover and inventory turnover).
9. Explain how internal control procedures are used to safeguard assets.
10. Prepare bank reconciliation.
11. Describe the purpose and relationship of journals and ledgers.
12. Analyze and describe how business transactions impact the accounting equation.
13. Apply the double-entry system of accounting to record business transactions and prepare a trial balance.
14. Explain the need for adjusting entries and record adjusting entries.
15. Prepare the financial statements for the different types of business operations and ownership structures.
16. Explain the purposes of the closing process and record closing entries.
17. Describe the differences between the periodic and perpetual inventory systems and record transactions.
18. Describe the difference between the gross price method and the net price method. Record transactions.
19. Determine cash paid for inventory and operating expenses.

20. Identify and describe the cost flow assumptions for inventory and explain the impact on the balance sheet and income statement.
21. Calculate cost of goods sold and ending inventory using LIFO and FIFO inventory costing methods.
22. Explain how inventory for a manufacturing business differs from inventory for a merchandising business.
23. Explain how an activity-based costing system operates, including the identification of activity cost pools, and the selection of cost drivers; and explain the flow of costs through the manufacturing accounts used in product costing.
24. Compute a predetermined overhead rate and explain its use in job-order costing.
25. Determine whether manufacturing overhead is over/under applied.
26. Prepare journal entries to record the costs of direct material, direct labor, and manufacturing overhead in a job-order costing system.
27. Prepare a schedule of cost of goods manufactured, a schedule of cost of goods sold, and an income statement for a manufacturer.
28. Complete the steps in the accounting cycle and prepare financial statements.
29. Calculate payroll taxes.
30. Determine the present value and future value cash flows.
31. Use net present value concepts to make investment decisions.
32. Explain the purpose and methods of cost allocation.
33. Calculate and record depreciation, depletion, and amortization; and explain the impact on the financial statements.
34. Record the sale and disposal of fixed assets and the impact on the financial statements.
35. Compare and contrast debt and equity financing.
36. Define and calculate TIE (times-interest-earned) ratio.
37. Compare and contrast a periodic payment note payable, a lump sum note payable, and a periodic and lump sum note payable.
38. Calculate the carrying value, interest expense, and cash payment for a note.
39. Record transactions for notes payable—issuance and interest expense.
40. Record transactions for bonds issued at face value, a premium, and a discount.
41. Record interest expense for bonds issued at face value, a premium, and a discount using the straight-line method and effective-interest method.
42. Identify and describe the different classes of stock, explain the rights afforded each class of stock, and record transactions.
43. Describe the difference between cash dividends, stock dividends, stock splits, and the impact on the financial statements.
44. Demonstrate employability and soft skills relative to the career cluster.
45. Apply math and communication skills within the technical content.

Advanced Multimedia Publishing 060761

This hands-on course applies advanced web design, publishing, and presentation concepts through the development of sophisticated documents and projects which include, but is not limited to, web sites, web databases, web movies, video editing and production, and television productions. This course is designed around the learning goals of the students and is project-based. Students will complete advanced projects agreed upon with the instructor utilizing hardware and software available. Formatting, editing, layout, and design concepts are reviewed and reinforced. Distribution ready publication standards are applied to all projects. Students will develop communication skills, problem-solving techniques, cooperative learning, and interpersonal skills. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Multimedia Publishing 060751

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Use industry-standard hardware and software components to create advanced multimedia projects including scanners, digital and video cameras, and production equipment.
2. Demonstrate an awareness of copyrighting, licensing, and downloading.
3. Demonstrate an awareness of safety issues.
4. Design and publish a web site with dynamic content using HTML and/or advanced features of a software package including tables, forms, edited images, animated gifs, .sound, web movies (Flash), databases, and forums.
5. Incorporate features into web pages for different audiences and cultures. Check for handicap accessibility.
6. Observe and practice safety precautions applicable to both classroom and home use of the Internet.
7. Create movies incorporating advanced features of video editing software.
8. Broadcast news programs and feature programs school-wide.
9. Demonstrate employability and soft skills relative to the career cluster.
10. Apply math, science, and communication skills relative to the career major.
11. Research and analyze career opportunities in multimedia publishing and graphic arts, video production, broadcasting, and web design.
12. Identify browser restrictions and variations.
13. Analyze, create, and organize navigational links.
14. Implement CGI and JavaScript programming where appropriate.
15. Develop an awareness of page load time with various connections of users.
16. Recognize appropriate backgrounds and fonts for business web sites.
17. Demonstrate Internet etiquette.
18. Publish web pages to a web server.
19. Formulate a user-friendly file structure for web publishing.

Advertising and Promotion 081511

This course is designed to provide students with a realistic "hands-on" application of techniques used in the advertising and promotion of goods and services. Students use typical media software and media equipment while being exposed to all forms of media (including print, internet, radio, and television) methods, budgets, and evaluations used by industry. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Marketing Principles 080716

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Explain the role of promotion as a marketing function.
3. Explain the types of promotions.
4. Identify the elements of the promotional mix.
5. Describe the use of business ethics in promotion.
6. Explain the types of advertising media.
7. Explain and give examples of how advertising and promotion influences the supply and demand of a product.
8. Demonstrate a knowledge of advertising principles as they apply to the creation of a website, print advertisement, or specialty advertisement.
9. Explain ways to make responsible buying decisions by evaluation of promotional ads.
10. Compare features, benefits, and price of products and services using various promotional items.
11. Develop a promotional plan.
12. Analyze how advertising and promotion jobs have changed due to scientific advancement and increased use of technology.
13. Use all types of digital media to design, organize, and communicate information and ideas.
14. Analyze how advertising techniques (such as jingles, slogans, plain folks, facts and figures, glittering, generalities, testimonial, bandwagon, emotional appeal) influence consumer decisions.
15. Prepare product promotions, community service promotions, and press releases.
16. Explain and evaluate crisis management (such as negative news releases).
17. Develop, plan, execute, and evaluate an advertising plan including marketing research, calendars, and budgets.
18. Establish a relationship between school and business activities by collaborating with business professionals.
19. Evaluate advertising campaigns and identify the psychological guidelines and associated techniques used in each campaign.

20. Demonstrate a knowledge of advertising principles as they apply to the creation of a web site.
21. Apply math and communication skills within the technical content.
22. Identify individual work habits and ethics such as individual/team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills. Explain their importance in the workplace.

Business and Marketing Career Exploration 060195

This course provides students with a survey of skills needed for school-to-work transition. Opportunities to explore the business and marketing career cluster and career paths, to heighten self-awareness, and to develop priorities and career decision-making skills are also provided. A variety of instructional resources, self-assessment instruments, and career interest surveys are included in the updating of the Individual Learning Plan (ILP). Interpersonal skill development and orientation to word processing, computer spreadsheet, and database are included. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 8 - 9

Recommended Credit: 1

Students will:

1. Reinforce basic skills in human relations in both written and oral communication including customer relations.
2. Develop a personal portfolio of careers to explore; research and prepare reports about business and marketing careers.
3. Complete self-assessment surveys to link interests, hobbies, skills, and school subjects to occupations.
4. Complete a career interest survey identifying general likes and dislikes, personal skills, and job values.
5. Complete a job application, compose a resume and a letter of application, and prepare for an interview.
6. Define world of work vocabulary, explain concepts relating to the world of work, and explore the importance of business ethics.
7. Develop and/or update Individual Learning Plans.
8. Develop decision-making, problem-solving, and critical thinking skills to become life-long learners and self-directed individuals.
9. Develop and prepare a budget using spreadsheet and database software, based upon a desired adult lifestyle.
10. Identify and summarize why people need to work to meet basic needs.
11. Describe what academic skills are needed for a career in the business and marketing cluster.
12. Explain and evaluate resources that can be used for researching job and career information.
13. Describe and explain the importance of good work habits and ethics in the workplace.
14. Explain how marketing jobs and careers have been created as a result of scientific and technological advancements.
15. Identify and explain skills used to seek, obtain, maintain, and change jobs or careers.
16. Apply communication skills within the technical content.
17. Demonstrate employability and soft skills relative to the career cluster.

Business and Marketing Essentials 060111

Business and Marketing Essentials is an introductory business and marketing course which enables students to acquire a realistic understanding of business processes and activities. Students examine fundamental economic concepts, the business environment, and primary business activities. They develop an understanding of and skills in such areas as customer relations, economics, emotional intelligence, financial analysis, human resources management, information management, marketing, operations, professional development, and strategic management. Throughout the course, students are presented ethical dilemmas and problem-solving situations for which they must apply academic and critical-thinking skills.

Recommended Grade Level: 9 - 10

Recommended Credit: 1

Students will:

1. Foster positive relationships with customers to enhance company image.
2. Understand fundamental economic concepts to obtain a foundation for employment in business.
3. Understand the nature of business to show its contributions to society. Analyze cost/profit relationships to guide business decision-making.
4. Understand economic systems to be able to recognize the environments in which businesses function.
5. Apply ethics to demonstrate trustworthiness.
6. Acquire a foundational knowledge of accounting to understand its nature and scope.
7. Acquire a foundational knowledge of finance to understand its nature and scope.
8. Understand the role and function of human resources management to obtain a foundational knowledge of its nature and scope.
9. Understand marketing's role and function in business to facilitate economic exchanges with customers.
10. Use information literacy skills to increase workplace efficiency and effectiveness.
11. Acquire a foundational knowledge of information management to understand its nature and scope.
12. Utilize information-technology tools to manage and perform work responsibilities.
13. Understand operation's role and function in business to value its contribution to a company.
14. Acquire self-development skills to enhance relationships and improve efficiency in the work environment.
15. Understand and follow company rules and regulations to maintain employment.
16. Participate in career planning to enhance job-success potential.
17. Implement job-seeking skills to obtain employment.
18. Utilize career-advancement activities to enhance professional development.
19. Recognize management's role to understand its contribution to business success.

Business Communications 060155

This course is the study of written, oral, and electronic communication in a business environment. Emphasis is on writing letters, preparing and orally presenting business reports, using the telephone in business, electronic transfer of information, using business information resources, listening and interpreting, and developing business messages. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate understanding of the communication process.
2. List techniques involved in active listening and possible barriers to communication.
3. Identify responsibilities of a competent communicator (respect, paying attention, participation, unnecessary disruption, and negative or disrespectful language).
4. Differentiate nonverbal communication from verbal communication.
5. Identify various forms of nonverbal symbols.
6. Apply technical writing skills including spelling and grammar, using reference materials, and proofreaders' marks.
7. Design, deliver, and apply qualities (courteous, clear, concise, concrete, correct, and complete) of effective and appropriate message to various audiences and occasions.
8. Identify various forms of techniques used to document references or citations (APA, MLA, or others).
9. Compose various types of business documents electronically including those associated with employment.
10. Demonstrate job interviewing techniques and develop a career portfolio including application, resume, and cover letter.
11. Understand different forms of etiquette including proper forms of telephone, Netiquette, e-mail, texting, social media, and other forms.
12. Understand plagiarism including incorrectly citing sources or presenting someone's information as their own.
13. Research career opportunities in communication and related careers utilizing supporting material including post-secondary connections.
14. Communicate a clear thesis and purpose in written and oral communication.
15. Create an outline to be used for an oral presentation.
16. Identify ways to manage speech anxiety and stress.
17. Construct and deliver organized oral presentations (student introduction, informative, persuasive, impromptu, or problem solving/customer service) with well-developed introductions, main points, conclusions, and transitions with appropriate visual aids.
18. Deliver speeches using appropriate and effective vocal and physical behaviors to enhance messages (vocal variety, articulations, and movements).
19. Acquire skills to communicate with others, both publicly and interpersonally.

20. Understand and identify the basic principles of effective group communication and listening.
21. Identify, analyze, and evaluate using different points of view including diversity, multiculturalism, globalization, and international business.
22. Demonstrate math, academic, employability, and occupational skills aligning to standards.

Business Economics (CTE Credit) 080317

This course is designed to be a comprehensive study of economics which meets the economics requirement for graduation. It provides an in-depth study of how people produce, distribute, and consume goods and services. Economic terminology, theory, and a comparison of economic systems and policies are integral to the course. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Digital Literacy 060112 **OR** Business and Marketing Essentials 060111

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Explain how laws and government mandates have been adopted to maintain competition in the U.S. and in the global marketplace.
2. Demonstrate an understanding of the cause and effect of the business cycles and how monetary and fiscal policy can be used to regulate these problems.
3. Compare and contrast a market economy, command economy, mixed economy and traditional economy based on their abilities to achieve social goals such as freedom, equity, and growth in the modern world.
4. Analyze the changing relationships among business, labor, and government and how each has affected production, distribution, and consumption.
5. Utilize decision-making models to make economic choices and determine the opportunity cost of those choices.
6. Explain how, in a free enterprise system, individuals attempt to maximize their profits based on their role in the economy.
7. Understand why people from other nations have come to the United States because of economic opportunities.
8. Demonstrate employability and soft skills relative to the career cluster.
9. Analyze economic concepts and understand their relevance to different economic situations.
10. Analyze the impact of international issues and concerns on personal, national, and international economics.
11. Analyze the role culture plays in economic issues of production, distribution, and consumption of goods and services.
12. Create graphs that illustrate shortages and surplus and describe how the market works to eliminate these conditions. Identify the effects each change has on equilibrium, price, and quantity.
13. Explain and give examples of how numerous factors influence the supply and demand of products.
14. Understand that scarcity is the basic economic problem facing individuals, societies, and nations.
15. Analyze how a nation's wealth and trade potential are tied to its resources.

16. Explore how international trade and multinational companies have led to a global economy.
17. Understand how the United States economy has changed from a rural to an industrial economy to a leader in the global economy.
18. Appraise the effects of technological changes, changes in consumer preferences, price inputs, environment, and legislation on supply and demand and price of goods and services.
19. Create the demand curve graph for two firms (one monopoly and one oligopoly) and explain the levels of output for a firm in perfect conditions.
20. Apply math and communication skills within the technical content.

Business Economics (Economics Credit) 060596

This course is designed to be a comprehensive study of economics which meets the economics requirement for graduation. It provides an in-depth study of how people produce, distribute, and consume goods and services. Economic terminology, theory, and a comparison of economic systems and policies are integral to the course. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Digital Literacy 060112 **OR** Business and Marketing Essentials 060111

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Explain how laws and government mandates have been adopted to maintain competition in the U.S. and in the global marketplace.
2. Demonstrate an understanding of the cause and effect of the business cycles and how monetary and fiscal policy can be used to regulate these problems.
3. Compare and contrast a market economy, command economy, mixed economy and traditional economy based on their abilities to achieve social goals such as freedom, equity, and growth in the modern world.
4. Analyze the changing relationships among business, labor, and government and how each has affected production, distribution, and consumption.
5. Utilize decision-making models to make economic choices and determine the opportunity cost of those choices.
6. Explain how, in a free enterprise system, individuals attempt to maximize their profits based on their role in the economy.
7. Understand why people from other nations have come to the United States because of economic opportunities.
8. Demonstrate employability and soft skills relative to the career cluster.
9. Analyze economic concepts and understand their relevance to different economic situations.
10. Analyze the impact of international issues and concerns on personal, national, and international economics.
11. Analyze the role culture plays in economic issues of production, distribution, and consumption of goods and services.
12. Create graphs that illustrate shortages and surplus and describe how the market works to eliminate these conditions. Identify the effects each change has on equilibrium, price, and quantity.
13. Explain and give examples of how numerous factors influence the supply and demand of products.
14. Understand that scarcity is the basic economic problem facing individuals, societies, and nations.
15. Analyze how a nation's wealth and trade potential are tied to its resources.

16. Explore how international trade and multinational companies have led to a global economy.
17. Understand how the United States economy has changed from a rural to an industrial economy to a leader in the global economy.
18. Appraise the effects of technological changes, changes in consumer preferences, price inputs, environment, and legislation on supply and demand and price of goods and services.
19. Create the demand curve graph for two firms (one monopoly and one oligopoly) and explain the levels of output for a firm in perfect conditions.
20. Apply math and communication skills within the technical content.

Business Education Co-Op 060107

Cooperative Education for CTE (Career and Technical Education) courses provides supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved capstone course during the same school year that the co-op experience is completed. Students who participate receive a salary for these experiences in accordance with local, state, and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Business Education Internship 060108

Internship for CTE (Career and Technical Education) courses provide supervised work-site experience for high school students who are enrolled in a capstone course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester or longer and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less). All information referenced to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Business Law 060121

This course develops an understanding of legal rights and responsibilities in personal law and business law with applications applied to everyday roles as consumers, citizens, and workers. The student will have an understanding of the American legal system, courts and court procedures, criminal justice system, torts, the civil justice system, oral and written contracts, sales contracts and warranties, and consumer protection. Legal terminology is emphasized. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Explain the levels found in the state and federal court systems and their jurisdictional limits.
2. Explain the differences between tort and criminal laws and how they relate to the business environment.
3. Identify ways laws affect individuals, sources of law, constitutional rights and responsibilities of U.S. citizens, and the responsibilities of government.
4. Describe and analyze the American Legal System.
5. Compare and contrast elements of civil (torts) and criminal law.
6. Describe the essential elements of a contract and demonstrate an understanding of the remedies/damages for breach of a contract.
7. Explain various aspects of consumer protection including deceptive advertising, agencies which aid the consumer, and federal legislation.
8. Explain commercial contracts and warranties.
9. Explain real and personal property and wills.
10. Examine and evaluate leasing of real property.
11. Examine and evaluate property and casualty insurance.
12. Describe rights and duties of employee, employer, and independent contractor and other important aspects of employment.
13. Identify civil rights, right to privacy, and ADA legislation affecting personnel practices such as compensation, promotion, recruitment, selection, termination, and training and development.
14. Describe legal reasons for terminating employees such as employment at will, embezzlement, and violation of company policy.
15. Identify and distinguish among sole proprietorships, partnerships and corporations.
16. Describe corporate financing procedures and the Securities Exchange Commission Laws that govern financial reporting procedures.
17. Describe bailment and the rights and duties of all parties.
18. Describe negotiable instruments and their relationships to commercial law.
19. Demonstrate a basic understanding of the methods of researching legal citations.
20. Demonstrate a basic understanding of how business law affects current events (local, national, international and geography cultural diversity).

21. Examine and evaluate a business and personal code of ethics.
22. Develop an understanding of a business's responsibility to know, abide by, and enforce laws and regulations that affect business operations and transactions including anti-trust laws, organized labor and regulatory agencies.
23. Apply ethical considerations resulting from various situations such as technological advances, international competition, employer-employee relationship, and consumer relations.
24. Research career opportunities in the legal profession.
25. Demonstrate employability and soft skills relative to the career cluster.
26. Apply communication skills within the technical content.
27. Differentiate between different types of bankruptcy filings.

Business Math (CTE Credit) 080772

This course enables the student to explore mathematical content for personal, business, and industrial use. Concepts are applied through problem-solving and real-world situations. A correlation to the math content in the Program of Studies was used in developing this course to count for the 4th math credit. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use the touch method on electronic calculators to solve real-world mathematical problems which relate to business and industry.
2. Apply math and communication skills within the technical content.
3. Use mathematical operations to enable students to understand gross and net income and different methods of earning income.
4. Demonstrate mathematical reasoning in figuring and recording checking and savings account transactions.
5. Calculate simple and compound interest of initial investment over a set amount of time.
6. Calculate a function identifying the dependent and independent variables (for example, unit price = price per time divided by measure or count).
7. Write a two variable equation to represent the amount of a lease payment (for example, if the lease pays $17 per $1,000).
8. Calculate the mean and standard deviation of the daily closing cost on a particular stock and plot the data and draw the curve of best fit.
9. Use a spreadsheet to calculate monthly interest, principal amount, and balance on a personal or business loan.
10. Analyze financial statements and calculate current ratio, debit-equity ratio, and return on capital.
11. Write and solve equations with two variables such as calculating gross pay based on salary plus commission.
12. Research and analyze career opportunities requiring application of math skills.
13. Use mathematical reasoning to compare cash purchases, credit cards, charge accounts, markups, and discounts.
14. Demonstrate mathematical reasoning in calculating various types of loans, investments, and interest, including compound interest.
15. Design and manipulate spreadsheets and graphs according to the availability of technology.
16. Use mathematical problem solving to figure the costs involved in purchasing and maintaining a vehicle and home and the methods of figuring depreciation.
17. Identify and compare various types of insurance.
18. Demonstrate mathematical applications relating to personnel, production, sales, marketing, warehousing, and distribution.
19. Demonstrate employability and emotional intelligence skills relative to the career cluster.

Business Math (Math Credit) 080780

This course enables the student to explore mathematical content for personal, business, and industrial use. Concepts are applied through problem-solving and real-world situations. A correlation to the math content in the Program of Studies was used in developing this course to count for the 4th math credit. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use the touch method on electronic calculators to solve real-world mathematical problems which relate to business and industry.
2. Apply math and communication skills within the technical content.
3. Use mathematical operations to enable students to understand gross and net income and different methods of earning income.
4. Demonstrate mathematical reasoning in figuring and recording checking and savings account transactions.
5. Calculate simple and compound interest of initial investment over a set amount of time.
6. Calculate a function identifying the dependent and independent variables (for example, unit price =price per time divided by measure or count).
7. Write a two variable equation to represent the amount of a lease payment (for example, if the lease pays $17 per $1,000).
8. Calculate the mean and standard deviation of the daily closing cost on a particular stock and plot the data and draw the curve of best fit.
9. Use a spreadsheet to calculate monthly interest, principal amount, and balance on a personal or business loan.
10. Analyze financial statements and calculate current ratio, debit-equity ratio, and return on capital.
11. Write and solve equations with two variables such as calculating gross pay based on salary plus commission.
12. Research and analyze career opportunities requiring application of math skills.
13. Use mathematical reasoning to compare cash purchases, credit cards, charge accounts, markups, and discounts.
14. Demonstrate mathematical reasoning in calculating various types of loans, investments, and interest, including compound interest.
15. Design and manipulate spreadsheets and graphs according to the availability of technology.
16. Use mathematical problem solving to figure the costs involved in purchasing and maintaining a vehicle and home and the methods of figuring depreciation.
17. Identify and compare various types of insurance.
18. Demonstrate mathematical applications relating to personnel, production, sales, marketing, warehousing, and distribution.
19. Demonstrate employability and emotional intelligence skills relative to the career cluster.

Computers, Networks, and Databases 111001

This project-based-learning course engages students who are curious about informatics. In this course, students will learn how to use a design process to create systems that acquire, store and communicate data for a variety of career fields. Students will work collaboratively in teams to design systems, solve problems, think critically, be creative, and communicate with each other and business partners. Students will participate in real-world experiences such as designing an inventory system for a retail store, comparing stores in a company to project future sales, track customer buying habits, and more. Lastly, students will engage in leadership skill sets encompassing their student organization responsibilities.

Districts that offer this SREB Advanced Career Course must have a SREB signed agreement and instructors must have taken the two-week per course training prior to teaching the course. Please see the link to SREB for further information. This course is Course 1 – Informatics in the SREB Advanced Career Curriculum.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use the technical design process to design, build, and test prototypes.
2. Use terminology of the field.
3. Use data and informatics tools to make decisions and solve problems.
4. Apply project management principles.
5. Use appropriate and effective research skills.
6. Demonstrate proficiency in word processing, spreadsheets, databases, and presentation software.
7. Communicate information, including descriptive statistics, to various stakeholder groups.

Data Modeling/SQL 070331

This course allows students to transform business requirements into an operational database using a systematic approach. Students will be engaged using data storage and retrieval techniques through activities that require teamwork, presentation skills, logical problem-solving, journaling and reflective thinking. Students will create and maintain database objects and store, retrieve, and manipulate data. Demonstrations and hands-on practice will be used for learning concepts. Students will apply SQL (Search and Query Language), an industry-standard language, to learn to build and manage database systems. Students will also learn interviewing skills and project management. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Use technology to complete daily database projects and assignments.
2. Identify and use basic data modeling and SQL (Search and Query Language) terms, concepts, and rules.
3. Create and analyze entity-relationship diagrams that meet an organization's needs.
4. Research and compare various careers in database management from entry-level to database administrator.
5. Demonstrate employability and soft skills relative to the career cluster.
6. Reflect on learning and projects by writing in a weekly journal.
7. Apply math and communication skills with technical content.
8. Articulate issues involving data security and keeping history of data in business systems.
9. Demonstrate professional soft skills.
10. Solve complex problems using data storage and retrieval techniques.

Databases in the Cloud 111003

This project-based-learning course is for students who successfully completed courses one and two and who want to tackle the more complex challenges that business and industry face. Students at this level will learn about Web technologies, cloud storage, information security, data, animation, introductory computer programming, and database applications. Students will take more responsibility for their own learning, problem solving and thinking outside of the box. Real-world challenges will require higher levels of research, building, testing, analyzing and improving systems. Students will develop solutions for real-world problems by designing a database for ticket sales; designing security for a database; creating a game with animation; reporting information based on population data in a community; and designing, building and testing an application for a database.

Districts that offer this SREB Advanced Career Course must have a SREB signed agreement and instructors must have taken the two-week per course training prior to teaching the course. Please see the link to SREB for further information. This course is Course 3 – Informatics in the SREB Advanced Career Curriculum.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use terminology of the field.
2. Research informatics technical texts, journal articles, and other related documents in developing a plan.
3. Use the five-step software/system life cycle (design, build, test, implement, and evolve).
4. Use informatics concepts to solve problems.
5. Use data and informatics tools to make decisions and solve problems.
6. Apply project management principles.
7. Gain information on how the American computer industry works.
8. Use appropriate and effective research skills.
9. Use best practices to design and implement research studies.
10. Use the scientific method to design investigations.
11. Demonstrate proficiency in word processing, spreadsheet, database, and presentation software.
12. Communicate information, including descriptive statistics, to various audiences.

Design for the Digital World 111002

This project-based-learning course engages students who are interested in applying the design process to create systems such as a cloud-based digital storage system for images. Students will design a system to automatically collect and report data on highway usage. They will apply a geospatial system to map a store and develop a database that studies shopping habits. Through these projects, students will learn about data management and logic-based queries by collecting data, using the Global Positioning System (GPS), and analyzing data utilizing a geographic information system (GIS). They will learn how to automate data collection to make processes more effective and efficient. Students will work collaboratively in teams and demonstrate their knowledge and skills by presenting new and innovative ideas, techniques and solutions to business and industry partners.

Districts that offer this SREB Advanced Career Course must have a SREB signed agreement and instructors must have taken the two-week per course training prior to teaching the course. Please see the link to SREB for further information. This course is Course 2 – Informatics in the SREB Advanced Career Curriculum.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use terminology of the field.
2. Research informatics technical texts, journal articles, and other related documents in developing a plan.
3. Use the five-step software/system life cycle (design, building, text, implement, and evolve).
4. Use informatics concepts to solve problems.
5. Use data and informatics tools to make decisions and solve problems.
6. Apply project management principles.
7. Gain information on how the American computer industry works.
8. Use appropriate and effective research skills.
9. Use best practices to design and implement research studies.
10. Use the scientific methods to design investigations.
11. Demonstrate proficiency in word processing, spreadsheet, database, and presentation software.
12. Communicate information, including descriptive statistics, to various audiences.

Developing a Cloud Presence 111004

Students in this capstone course will focus on the ethics of privacy, social networking, designing for clients, and artificial intelligence through six authentic projects. Students will select a business partner and design, build, and test a Web presence for a company that will apply the concepts from the three prior courses. Student teams will work collaboratively with a business partner to develop a proposal for the project with evaluation criteria. Once the business partner accepts the proposal, the student team will implement it by designing, planning, building the system, and testing and revising the system to meet the needs of the business. Depending on articulation agreements or state policy, opportunity for dual credit may be available to students who successfully complete this course.

Districts that offer this SREB Advanced Career Course must have a SREB signed agreement and instructors must have taken the two-week per course training prior to teaching the course. Please see the link to SREB for further information. This course is Course 4 – Informatics in the SREB Advanced Career Curriculum.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use terminology of the field.
2. Research informatics technical texts, journal articles, and other related documents in developing a plan.
3. Use the five-step software/system life cycle (design, building, text, implement, and evolve).
4. Use informatics concepts to solve problems.
5. Use data and informatics tools to make decisions and solve problems.
6. Apply project management principles.
7. Gain information on how the American computer industry works.
8. Use appropriate and effective research skills.
9. Use best practices to design and implement research studies.
10. Use the scientific methods to design investigations.
11. Demonstrate proficiency in word processing, spreadsheet, database, and presentation software.
12. Communicate information, including descriptive statistics, to various audiences.

Digital Literacy 060112

Students will use a computer and application software including word processing, presentation, database, spreadsheet, internet, and email to prepare elementary documents and reports. The impact of computers on society and ethical issues are presented. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use a word processing program to create, save, print, modify, spell-check, and grammar-check a simple document.
2. Use a word processing program to enhance the appearance of a simple document by using centered, right justification, boldface, underlined, and italicized text.
3. Use a word processing program to change the default margins and line spacing.
4. Use a word processing program to create a document with headers, footers, and footnotes.
5. Use a presentation program with text body, graphics, and animation.
6. Use an electronic spreadsheet program to create, save, print, modify, and obtain graphs from a simple spreadsheet.
7. Use an electronic spreadsheet program to perform basic mathematical operations including, but not limited to, addition, subtraction, multiplication and division.
8. Use an electronic spreadsheet program to calculate averages and percentages.
9. Use an electronic spreadsheet program to enhance the appearance of a spreadsheet by changing fonts, foreground, and background colors and centering text across columns.
10. Use a database management program to create, maintain, and print reports from a simple relational database.
11. Use a database management program to customize the user interface by creating and maintaining forms and reports.
12. Use a database management program to query tables using basic query operations such as “and”, “or”, and “not”.
13. Print in landscape and portrait orientations.
14. Use the component of the operating system that helps the user manipulate files and folders to copy, move, rename, and delete files and to create, copy, move, rename, and delete folders.
15. Use the World Wide Web browser to navigate hypertext documents and to download files.
16. Use Internet search engines and understand their advantages and disadvantages.
17. Use an electronic mail program to send and receive electronic mail.
18. Identify components of a computer.
19. Discriminate between ethical and unethical uses of computers and information.
20. Demonstrate a basic understanding of issues regarding software copyright, software licensing, and software copying.

21. Demonstrate an awareness of computer viruses and basic understanding of ways to protect a computer from viruses.
22. Demonstrate a basic understanding of the impact of computers on society.
23. Use and understand basic computer terminology.

Ethical Leadership 060109

Ethical Leadership is a principles-based ethics course introducing students to key leadership and ethical knowledge and skills, including integrity, trust, accountability, transparency, fairness, respect, rule of law, and viability. Throughout the course, students apply ethical principles to contemporary, real-world situations that teens and young adults often encounter in school, at home, with friends, and in entry-level job positions. They examine the concept of ethical leadership and strengthen their leadership and ethical decision-making skills through the planning, implementation, and evaluation of at least one class service-learning project. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Acquire foundational knowledge of business laws and regulations to understand their nature and scope.
2. Apply active listening skills to demonstrate understanding of what is being said.
3. Apply verbal skills to obtain and convey information.
4. Foster self-understanding to recognize the impact of personal feelings on others.
5. Apply ethics to demonstrate trustworthiness.
6. Exhibit techniques to manage emotional reactions to people and situations.
7. Identify with others' feelings, needs, and concerns to enhance interpersonal relations.
8. Use communication skills to foster open, honest communications.
9. Use communication skills to influence others.
10. Manage stressful situations to minimize potential negative impact.
11. Implement teamwork techniques to accomplish goals.
12. Employ leadership skills to achieve workplace objectives.
13. Manage internal and external business relationships to foster positive interactions.
14. Utilize project-management skills to improve workflow and minimize costs.
15. Acquire self-development skills to enhance relationships and improve efficiency in the work environment.
16. Understand and follow company rules and regulations to maintain employment.
17. Utilize critical-thinking skills to determine best options/outcomes.
18. Identify individual work habits and ethics such as individual and team skills, confidentiality, problem solving, punctuality, self-discipline, and communication skills. Explain their importance in the work place.

Fashion Marketing 080111

This course is a specialized course that provides instruction in marketing of apparel and accessories. This course is based upon the business and marketing core that includes communication skills, economics, operations, professional development, promotion, selling, distribution and product/service management. The instruction includes basic fashion and marketing basics, the use of design and color, promotions, visual merchandising and career opportunities. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Analyze historical and current fashion trends.
3. Explain the importance of the fashion industry to the economy.
4. Apply marketing concepts such as market segmentation and target markets as they relate specifically to the fashion industry.
5. Identify the impact of globalization on the fashion industry.
6. Explain types of business ownership.
7. Explain the types of fashion retailers.
8. Interpret and apply the use of design elements in fashion.
9. Analyze the use of color as it relates to apparel and visual merchandising.
10. Identify and analyze retail positioning techniques.
11. Describe merchandising and buying procedures.
12. Analyze and apply the marketing mix to the fashion industry.
13. Apply math and communication skills needed in the fashion industry.
14. Demonstrate selling and customer service skills related to the fashion industry.
15. Compare career opportunities in the fashion industry.
16. Interpret and use technological skills to research and present evaluations of successful fashion designers.
17. Identify individual work habits and ethics such as individual/team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills. Explain their importance in the workplace.
18. Identify team skills such as setting goals, following directions, conflict resolution, listening, and time management. Explain how they are important when working in the fashion industry.
19. Demonstrate skills needed to organize and promote a fashion show.

Fashion Marketing Management 080132

This course is designed as a continuation of Fashion Marketing and provides an in-depth study of merchandising techniques, fashion trends, fashion promotion, and management skills. This course is based on the business and marketing core that includes communication skills, economics, operations, professional development, promotion, selling, distribution, and product/service management. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Prerequisite: Fashion Marketing 080111

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Examine the role of management and specific management styles.
3. Compare types of business ownership.
4. Describe current economic trends in the United States and outline the influence of the trends on decision-making in fashion marketing.
5. Describe the impact of economic indicators such as consumer discretionary income, inflation, gross domestic product, and productivity on consumer spending on fashion.
6. Contrast typical profit margins of manufacturers, wholesalers, and retailers in the fashion industry.
7. List and describe typical channels of distribution utilized in fashion marketing.
8. Identify and describe major laws that regulate and/or impact the fashion industry.
9. Demonstrate an understanding of forecasting sales, calculating financial ratios, explaining the nature of operating budgets, and developing company department budgets.
10. Define market segmentation and describe its relationship to target marketing.
11. Define market research and list several methods of conducting research.
12. Analyze fashion apparel buying and merchandising procedures.
13. Prepare a buying plan and calculate open-to-buy based on cost and retail for selected products in an identified business.
14. Explain the selling process and the nature of sales management.
15. Explain the nature of product branding and develop strategies to position product/business.
16. Create a fashion related visual merchandise display.
17. Develop a promotion plan with a budget.
18. Apply design and color concepts to create a collection of apparel items based on the customers' style, colors, shape, and wants.
19. Demonstrate skills needed to organize and promote a fashion show.
20. Apply math and communication skills needed in the fashion industry.
21. Demonstrate employability and social skills relative to the fashion industry.
22. Research a fashion marketing career path from entry-level position to management.

23. Identify individual work habits and ethics such as individual/team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills. Explain their importance in the workplace.

Financial Analysis for Managers 060399

Financial Analysis for Managers is not strictly an accounting course, a finance course, or a management course. Instead, it is a course that brings together all three of these business functions. It introduces students to accounting and finance knowledge and skills that all managers should possess, regardless of business type, size, or department. In this course, would-be members of management forecast sales, develop budgets, manage cash flow, develop expense control plans, interpret financial statements, and much more. Throughout the course, students are presented problem-solving situations for which they must apply academic and problem-solving skills. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Personal Finance 080719 **OR** Accounting and Finance Foundations 060122

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Report findings to communicate research information to others.
2. Understand the fundamental principles of money needed to make financial exchanges.
3. Identify potential business threats and opportunities to protect a business's financial well-being.
4. Apply the procedures for recording temporary and long-term investments and receivables.
5. Apply the procedures for determining and recording the cost of long-term assets.
6. Apply the methods of allocating the cost of long-term assets.
7. Apply the procedures for recording current and long-term liabilities.
8. Describe the characteristics of a partnership.
9. Allocate partnership earnings and record the effect of changes in ownership and liquidations.
10. Describe the characteristics of a corporation.
11. Analyze and record transactions involving stockholders' equity.
12. Determine suitable internal accounting controls to ensure the proper recording of financial transactions.
13. Implement accounting procedures to track money flow and to determine financial status.
14. Maintain inventory records to track the location, quantity, and value of current assets.
15. Acquire a foundational knowledge of finance to understand its nature and scope.
16. Manage financial resources to ensure solvency.
17. Prepare a statement of cash flows.
18. Utilize managerial accounting methods to track, record, and analyze business costs.
19. Manage finances to monitor and measure return on investment (ROI).
20. Implement expense-control strategies to enhance a business's financial wellbeing.
21. Understand the fundamentals of managerial accounting to aid in financial decision-making.

22. Control an organization’s/department’s activities to encourage growth and development.

Financial Management 070122

Financial Management introduces students to a wide range of financial analysis, managerial decision making, and financial accounting concepts and skills including performance metrics, cash-flow management, expense-control strategies, depreciation and obsolescence evaluation, the accounting cycle, and much more. Students prepare and interpret financial statements, forecast sales, develop budgets, and conduct multiple forms of financial analysis. Financial regulations, accounting standards, and financial information technology are also emphasized throughout the course. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Accounting and Finance Foundations 060122

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Understand regulation of financial activities to adhere to government requirements.
2. Identify potential business threats and opportunities to protect a business's financial well-being.
3. Acquire a foundational knowledge of accounting to understand its nature and scope.
4. Classify, record, and summarize data to produce needed financial information.
5. Implement accounting procedures to track money flow and to determine financial status.
6. Maintain cash controls to track cash flow.
7. Perform accounts payable functions to record, control, and disburse payments.
8. Perform accounts receivable functions to record, control, and collect payments due from the sale of goods and services.
9. Understand the implications of maintaining a workforce on business finances.
10. Understand inventory records to track the location, quantity, and value of current assets.
11. Perform specialized accounting procedures to track cash flow.
12. Manage financial resources to ensure solvency.
13. Utilize managerial accounting methods to track, record, and analyze business costs.
14. Manage finances to monitor and measure return on investment (ROI).
15. Implement expense-control strategies to enhance a business's financial well-being.
16. Acquire knowledge of accounting standards to record and report financial data appropriately.
17. Understand the fundamentals of managerial accounting to aid in financial decision-making.
18. Control an organization's/department's activities to encourage growth and development.
19. Control an organization's/department's activities to encourage growth and development.
20. Utilize financial information technology tools to manage financial information and perform work responsibilities.
21. Understand the importance of accurately reporting a business's financial position to provide information in a proper manner.

Financial Services I 060311

This course is designed for students interested in pursuing a career in the financial institution field. It involves operations of a student financial center in cooperation with a sponsoring bank, which provides application of banking and financial procedures and concepts. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: One Business or Marketing credit and special consent of instructor.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Develop and manage a student financial center through the sponsorship of a local bank.
2. Research career opportunities in financial services.
3. Demonstrate financial activities of a student financial center including preparing, maintaining, and analyzing financial statements.
4. Apply communication skills and demonstrate appropriate customer/employee and employee/employer interactions and relations.
5. Define basic banking terminology and develop an understanding of how banks function within the U.S. economy.
6. Demonstrate and understand the importance of marketing skills when operating a student financial center.
7. Produce documents integrating current word processing, database, and spreadsheet applications.
8. Understand the functions of the Federal Reserve System and the role of FDIC (Federal Deposit Insurance Corporation).
9. Practice safety and security procedures when operating the student financial center.
10. Perform a variety of banking operations such as operating a teller station, reconciling accounts with statements, preparing cash in and cash out tickets, processing cash and checks for deposit, processing loan applications, and accepting loan payments.
11. Develop an employment portfolio and demonstrate job interview techniques.
12. Define examples of credit used by consumers, businesses, and government.
13. Apply math and communication skills within the technical content.
14. Develop standards and policies for extending credit and making collections.
15. Discuss relationship between retailers and financial services such as in-store banks, ATMs, credit cards, financing, and layaway.
16. Demonstrate employability and soft skills relative to the career cluster.
17. Utilize available technology in the daily operation of the financial center.

Financial Services II 060351

Financial Services II is a continuation of Financial Services I providing opportunities to enhance the student's employment portfolio. Students continue to learn and practice financial activities associated with the operation of a bank and other finance-related institutions in addition to assuming management and supervisory responsibilities, including training "new employees". Students will participate in a work-based learning experience. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Financial Services I 060311

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Demonstrate interpersonal management skills and provide training and supervision for new employees.
2. Continue financial activities of student financial center, including preparing, maintaining, and analyzing financial statements.
3. Participate in a work-based learning experience related to a financial services industry.
4. Explain operations of the student financial center to first-year students.
5. Plan, organize, and prepare financial center for opening.
6. Apply communication skills by preparing and presenting oral presentations on work ethics, professional image, and other work-related topics.
7. Update employment portfolio.
8. Demonstrate decision-making skills and teamwork by reviewing current fee structure, policies, interest rates, and products and making recommendations for change if needed.
9. Identify financial management practices and the purposes of savings and banking services such as checking and savings accounts, debit and credit, and certificates of deposit.
10. Apply appropriate math and communication skills relative to the career cluster.
11. Demonstrate employability and soft skills relative to the career cluster.

Fundamentals of Social Media Marketing 081310

This course cultivates a basic to intermediate understanding of social media history, terminology, and concepts as they apply to the marketing and business sectors. Integrates a working knowledge of platform management and simple social media marketing strategy. Students learn how to practice good marketing principles in an "electronic" marketing place. Decision-making and problem-solving skills are involved in such units as human relations, distribution, market information management, and product/service planning. The employment skills learned will improve and increase the change of successful transition into the world of work. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Elucidate the progression of social media platforms and technologies.
3. Connect the necessity of social media as it pertains to marketing, business, and the consumer.
4. Identify and elaborate on fundamental terminology of social media – such as a brand, content, sharing, advocates, metrics/analytics, demographics, compliance, integration, types of social media platforms (rented/owned/occupied), dashboard.
5. Compose social media strategies: content marketing, holistic social marketing, and social media metrics.
6. Determine appropriate online platforms for a given business or industry and display best practices for each platform.
7. Integrate a working understanding of platform management and social media marketing strategy to form a simple (cross-platform) social media campaign to grow an online community.
8. Explain the impact of the Internet on marketing.
9. Identify ways that technology impacts business.
10. Survey the various disciplines in electronic marketing, including promotion, store pricing, purchasing, web sales, warehousing, distribution, staffing, site maintenance, and customer relations.
11. Apply math, science, and communication skills within the technical content.
12. Reinforce communication, human relations, writing and speaking skills through communications in the promotion, sale, site management and customer service units.
13. Demonstrate problem-solving and decision-making skills as they apply in human relations, market information management, site maintenance or product service planning.
14. Develop real-life portfolio entries through web sites, web pages, and electronic advertisement learned in a promotion unit.

15. Investigate the various types of risks that impact business activities; categorize the risks as natural, human, electronic, or economic. Explain methods of business uses to control risks and security in the electronic market.
16. Understand the role and characteristics of marketing in three different types of economic systems; capitalism, socialism and communism in a worldwide electronic market.
17. Utilize activities of the DECA student organization as an integral component of course content and leadership development.
18. Create a career portfolio including a resume, letters of reference, certifications of training, and samples of work.
19. Investigate and analyze the role of technology in improving the marketing process.
20. Develop a marketing plan for a new or existing business or product line.
21. Identify individual work habits and ethics such as individual/team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills. Explain their importance in the workplace.

International Business 060188

This course is designed to provide students with basic knowledge and skills related to international economic activities and global business transactions. Students will examine the relationship of global business activities to nations, companies, and individuals in their roles as workers, consumers, and citizens and will examine economic, cultural, geographic, historic, and technological influences on global business activities, management principles, human relation theories, information systems, production, marketing, and finance activities. Students will also explore career planning, mathematical and data analysis, written and oral communication, and problem-solving skills related to international business activities. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Explain the impact international business has on consumers, businesses, and countries.
2. Discuss how the economic, socio-cultural, political, legal, and technological influences affect international business activities.
3. Analyze foreign trade activities.
4. Define methods of conducting international business.
5. Describe information systems and communications for international business.
6. Evaluate human resource needs.
7. Evaluate business management techniques and international marketing activities.
8. Analyze foreign exchange rates and currency values.
9. Analyze the global impact of the stock and bond markets.
10. Research and analyze career opportunities in international business.
11. Demonstrate employability and soft skills relative to the career cluster.
12. Apply math and communication skills within the technical content.

Introduction to Finance 060301

Introduction to Finance expands student understanding of finance. Students develop their knowledge and skills in such areas as business law, customer relations, economics, financial analysis, financial-information management, human resources management, operations, professional development, and strategic management. Emphasis is placed on topics including financial markets, services, and regulations, as well as the need for effective safety and security procedures and information management in finance. Current technology will be used to acquire information and to complete activities. Throughout the course, students are presented ethical dilemmas and problem-solving situations for which they must apply academic and critical-thinking skills. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Apply knowledge of business ownership to establish and continue business operations.
2. Understand government regulations pertaining to the finance industry to protect the company wellbeing.
3. Acquire a foundational knowledge of compliance to understand its nature and scope.
4. Foster positive relationships with customers to enhance company image.
5. Understand characteristics, motivations, and behaviors of clients in finance to facilitate client interaction.
6. Resolve conflicts with/for customers to encourage repeat business.
7. Reinforce company's image to exhibit the company's brand promise.
8. Understand the nature of business to show its contributions to society.
9. Acquire knowledge of the impact of government on business activities to make informed economic decisions.
10. Analyze cost/profit relationships to guide business decision-making.
11. Understand the use of financial-services providers to aid in financial-goal achievement.
12. Use investment strategies to ensure financial well-being.
13. Acquire a foundational knowledge of accounting to understand its nature and scope.
14. Acquire a foundational knowledge of finance to understand its nature and scope.
15. Understand financial markets to recognize their importance in business.
16. Acquire foundational knowledge of financial-information management to understand its scope and nature.
17. Manage staff growth and development to increase productivity and employee satisfaction.
18. Adhere to health and safety regulations to support a safe work environment.
19. Implement safety procedures to minimize loss.
20. Implement security policies/procedures to minimize chance for loss.
21. Comply with security rules, regulations, and codes (property, privacy, access, confidentiality) to protect customer and company information, reputation, and image.

22. Implement purchasing activities to obtain business supplies, equipment, resources, and services.
23. Implement purchasing activities to obtain business supplies, equipment, resources, and services.
24. Understand production's role and function in business to recognize its need in an organization.
25. Maintain property and equipment to facilitate ongoing business activities.
26. Understand supply chain management role to recognize its need in business.
27. Participate in career planning to enhance job-success potential.
28. Utilize career-advancement activities to enhance professional development.
29. Acquire knowledge of banking processes and services to facilitate workplace activities.
30. Acquire knowledge of corporate governance to be aware of the restraints imposed upon finance functions.
31. Acquire knowledge of the insurance industry to obtain a foundation for employment in insurance.
32. Identify potential business threats and opportunities to protect a business's financial well-being.

Introduction to Management 060411

Introduction to Management expands student understanding of management. It exposes students to several types of management, including customer relationship management, human resources management, knowledge management, information management, project management, quality management, risk management, and strategic management. Business law, communication skills, economics, operations, and professional development are also stressed throughout the course. Current technology will be used to acquire information and to complete activities. Throughout the course, students are presented ethical dilemmas and problem-solving situations for which they must apply academic and critical-thinking skills. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Apply knowledge of business ownership to establish and continue business operations.
2. Read to acquire meaning from written material and to apply the information to a task.
3. Apply verbal skills to obtain and convey information.
4. Record information to maintain and present a report of business activity.
5. Foster positive relationships with customers to enhance company image.
6. Resolve conflicts with/for customers to encourage repeat business.
7. Reinforce company's image to exhibit the company's brand promise.
8. Understand the nature of customer relationship management to show its contributions to a company.
9. Understand the nature of business to show its contributions to society.
10. Acquire knowledge of the impact of government on business activities to make informed economic decisions.
11. Analyze cost/profit relationships to guide business decision-making.
12. Understand the role and function of human resources management to obtain a foundational knowledge of its nature and scope.
13. Manage staff growth and development to increase productivity and employee satisfaction.
14. Acquire a foundational understanding of knowledge management to understand its nature and scope.
15. Acquire a foundational knowledge of information management to understand its nature and scope.
16. Adhere to health and safety regulations to support a safe work environment.
17. Implement safety procedures to minimize loss.
18. Comply with security rules, regulations, and codes (property, privacy, access, confidentiality) to protect customer and company information, reputation, and image.
19. Utilize project-management skills to improve workflow and minimize costs.
20. Implement purchasing activities to obtain business supplies, equipment, resources, and services.

21. Implement purchasing activities to obtain business supplies, equipment, resources, and services.
22. Understand production's role and function in business to recognize its need in an organization.
23. Maintain property and equipment to facilitate ongoing business activities.
24. Understand supply chain management role to recognize its need in business.
25. Maintain work flow to enhance productivity.
26. Participate in career planning to enhance job-success potential.
27. Understand the role and function of quality management to obtain a foundational knowledge of its nature and scope
28. Recognize management's role to understand its contribution to business success.
29. Identify potential business threats and opportunities to protect a business's financial well-being.

Leadership Dynamics 080799

This course is designed to assist students with developing skills needed to be successful leaders and responsible members of society. The student will develop personal attributes and social skills. Emphasis will be placed on interpersonal skills, team building, communication, personal development, and leadership. This course will include opportunities for students to apply their knowledge. Leadership development will be provided through a Career and Technical Student Organization (CTSO) related to the pathway.

Leadership Dynamics may not be used or substituted for pathway courses in order to achieve Preparatory or Completer status.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Develop personal and group goals.
2. Compare the types of leadership styles.
3. Assess the importance of qualified leaders to the success of organizations.
4. Appraise personal characteristics of successful leaders.
5. Develop verbal and non-verbal communication skills to enhance success in school and transition to the world of work.
6. Demonstrate appropriate professional etiquette.
7. Demonstrate shared decision making.
8. Develop techniques to resolve conflicts that occur in school, home, community, and workplace (interpersonal team skills).
9. Demonstrate the use of parliamentary procedure skills in presiding over a meeting.
10. Describe how ethical and social behaviors affect our lives.
11. Identify self-management techniques.
12. Identify stress management techniques.
13. Analyze organizational structures and their components including bylaws, officers, committees, and program of work.
14. Demonstrate awareness of cultural diversity and equity issues.
15. Analyze leadership opportunities available in the school and community.

Legal Office 070881

This course enables a student to gain concepts, skills, and techniques in legal terminology and various forms used in the legal profession. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Digital Literacy 060112

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Explain legal terminology and legal business terminology.
2. Apply formatting to court documents such as adoption papers, affidavits, briefs, and depositions.
3. Apply formatting to client documents such as mortgages, promissory notes, and wills.
4. Demonstrate the ability to take and transcribe minutes from a meeting.
5. Create and format various personal and business documents using word processing software; apply language arts rules; and use proofreaders' marks, spell check and thesaurus, reference materials, and grammar check.
6. Demonstrate proper telephone etiquette, identify different types of electronic communications, and use postal and shipping services.
7. Explain records management, demonstrate the various methods of filing, and create a database management system.
8. Use the computer and electronic calculator, electronic desktop management software, and machine transcription equipment.
9. Research and analyze career opportunities in legal careers, demonstrate job interview techniques, and develop an employment portfolio including a letter of application and resume.
10. Apply standard rules of spelling, punctuation, grammar, and capitalization.
11. Demonstrate employability and soft skills relative to the career cluster.
12. Apply communication skills within the technical content.

Marketing Applications 080717

Marketing Applications furthers student understanding and skills in the various marketing functions. Students coordinate channel management with other marketing activities, discuss the nature of marketing plans, generate product ideas, coordinate activities in the promotional mix, and demonstrate specialized sales processes and techniques. Economic and financial concepts are also stressed throughout the course. Current technology will be used to acquire information and to complete the projects. Throughout the course, students are presented problem- solving situations for which they must apply academic and critical-thinking skills. Formal reflection is an on-going component of the course along with four projects. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Marketing Principles 080716, Advertising and Promotion 081511, Retail Marketing 081411, **OR** other similar level Marketing Courses.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Write internal and external business correspondence to convey and obtain information effectively.
2. Understand the nature of customer relationship management to show its contributions to a company.
3. Acquire knowledge of the impact of government on business activities to make informed economic decisions.
4. Analyze cost/profit relationships to guide business decision-making.
5. Understand economic indicators to recognize economic trends and conditions.
6. Determine global trade's impact on business decision-making.
7. Use communication skills to foster open, honest communications.
8. Use communication skills to influence others.
9. Manage stressful situations to minimize negative workplace interactions.
10. Acquire a foundational knowledge of accounting to understand its nature and scope.
11. Implement accounting procedures to track money flow and to determine financial status.
12. Manage financial resources to ensure solvency.
13. Understand marketing's role and function in business to facilitate economic exchanges with customers.
14. Acquire foundational knowledge of customer/client/business behavior to understand what motivates decision-making.
15. Utilize critical-thinking skills to determine best options/outcomes.
16. Manage channel activities to minimize costs and to determine distribution strategies.
17. Interpret marketing information to test hypotheses and/or to resolve issues.
18. Evaluate marketing research procedures and findings to assess their credibility.
19. Employ marketing-information to develop a marketing plan.
20. Generate product ideas to contribute to ongoing business success.
21. Employ product-mix strategies to meet customer expectations.

22. Position company to acquire desired business image.
23. Understand the use of an advertisement's components to communicate with targeted audiences.
24. Understand the use of public-relations activities to communicate with targeted audiences.
25. Understand the use of trade shows/expositions to communicate with targeted audiences.
26. Manage promotional activities to maximize return on promotional efforts.
27. Understand sales activities to show command of their nature and scope.
28. Acquire product knowledge to communicate product benefits and to ensure appropriateness of product for the customer.
29. Understand sales processes and techniques to enhance customer relationships and to increase the likelihood of making sales.
30. Perform pre-sales activities to facilitate sales presentation.
31. Employ sales processes and techniques to enhance customer relationships and to increase the likelihood of making sales.
32. Process the sale to complete the exchange.

Marketing Education Co-Op 080707

Cooperative Education for CTE courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved capstone course during the same school year that the co-op experience is completed. Students who participate receive a salary for these experiences, in accordance with local, state and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Marketing Education Internship 080708

Internship for CTE courses provide supervised work-site experience for high school students who are enrolled in a capstone course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester or longer and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less). All information referenced to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Marketing Principles 080716

Marketing Principles introduces students to the dynamic processes and activities in marketing. The course develops student understanding and skills in the functional areas of marketing, as well as business law, communication skills, customer relations, economics, human resources management, and operations. Current technology will be used to acquire information and to complete activities. Throughout the course, students are presented ethical dilemmas and problem-solving situations for which they must apply academic and critical-thinking skills. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Apply knowledge of business ownership to establish and continue business operations.
2. Acquire foundational knowledge of channel management to understand its role in marketing
3. Read to acquire meaning from written material and to apply the information to a task.
4. Apply verbal skills to obtain and convey information.
5. Record information to maintain and present a report of business activity.
6. Foster positive relationships with customers to enhance company image.
7. Resolve conflicts with/for customers to encourage repeat business.
8. Reinforce company's image to exhibit the company's brand promise.
9. Acquire knowledge of the impact of government on business activities to make informed economic decisions.
10. Analyze cost/profit relationships to guide business decision-making.
11. Manage staff growth and development to increase productivity and employee satisfaction.
12. Acquire foundational knowledge of marketing-information management to understand its nature and scope.
13. Understand marketing's role and function in business to facilitate economic exchanges with customers.
14. Develop marketing strategies to guide marketing tactics.
15. Select target market appropriate for product/business to obtain the best return on marketing investment (ROMI).
16. Adhere to health and safety regulations to support a safe work environment.
17. Implement safety procedures to minimize loss.
18. Implement security policies/procedures to minimize chance for loss.
19. Comply with security rules, regulations, and codes (property, privacy, access, confidentiality) to protect customer and company information, reputation, and image.
20. Implement purchasing activities to obtain business supplies, equipment, resources, and services.
21. Understand production's role and function in business to recognize its need in an organization.

22. Maintain property and equipment to facilitate ongoing business activities.
23. Understand supply chain management role to recognize its need in business.
24. Participate in career planning to enhance job-success potential.
25. Acquire a foundational knowledge of promotion to understand its nature and scope.
26. Acquire a foundational knowledge of selling to understand its nature and scope.
27. Acquire product knowledge to communicate product benefits and to ensure appropriateness of product for the customer.
28. Understand sales processes and techniques to enhance customer relationships and to increase the likelihood of making sales.
29. Employ sales processes and techniques to enhance customer relationships and to increase the likelihood of making sales.

Medical Office 070971

This course enables students to gain concepts, skills, and techniques in medical terminology and various forms used in the medical profession. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Digital Literacy 060112 **AND** Office Administration 070743 **OR** Microsoft Office Specialist (MOS/MCAS) 070750

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Explain and apply medical terminology in medical office documents and procedures.
2. Identify medical legal and ethical responsibilities and comply with HIPAA (Health Insurance Portability and Accountability Act) rules and regulations.
3. Apply formatting to medical documents such as admitting forms, discharge forms, and insurance forms.
4. Assist patients in completing medical forms and processing medical insurance.
5. Demonstrate the ability to schedule patient office appointments, hospital admissions, outpatient surgery, and ancillary testing.
6. Demonstrate ability to receive and process patients and visitors, properly code diagnoses and surgical procedures, and work with other patient services and records.
7. Illustrate financial services involved in the medical office profession such as accepting payment of patient accounts, billing, past-due fee collection, payroll management, and banking procedures.
8. Demonstrate the ability to transcribe medical records.
9. Maintain office equipment and supplies.
10. Demonstrate proper telephone etiquette and identify different types of electronic communications.
11. Use postal and shipping services and process mail and office correspondence.
12. Discuss principles of using electronic medical records, demonstrate the various methods of accurate filing, and create a database management system.
13. Research and analyze career opportunities in medical careers, demonstrate job interview techniques, and develop an employment portfolio including a letter of application and resume.
14. Apply decision-making and priority-setting skills.
15. Complete simulated tasks.
16. Create and analyze reports.
17. Apply standard rules of spelling, punctuation, grammar, and capitalization.
18. Demonstrate employability and soft skills relative to the career cluster.
19. Apply math and communication skills within the technical content.
20. Identify safety rules applicable to this course and demonstrate appropriate observance of said rules, including but not limited to, trip hazards, electrical cords and outlets, evacuation procedures for emergency situations (fire, tornado, bomb threat, and

earthquake), lockdown procedures for emergency situations, and location and contents of first aid kit and MSDS (Material Safety Data Sheets).

Microsoft Office Specialist (MOS/MCAS) 070750

Students will have the opportunity to increase their computer skills. Advanced functions and integration of Microsoft Word, Excel, Access, Outlook, and PowerPoint will be taught. Students will work toward MOS/MCAS Certification in one or more of the Microsoft areas. In addition, students will utilize Internet access to complete various projects. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Prerequisite: Digital Literacy 060112 **AND** consent of instructor

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Use and apply a repertoire of technology skills regularly in the preparation of content assignments and authentic projects.
2. Utilize Windows Operating System, Internet resources, and industry-standard hardware and software.
3. Perform advanced functions using Microsoft Word, Access, Excel, and PowerPoint.
4. Create real-world documents and publications using Word, Access, Excel, and PowerPoint to demonstrate formatting techniques used in text, graphics, and text boxes.
5. Insert and modify tables, diagrams, and charts.
6. Create bulleted lists, numbered lists, and outlines.
7. Insert and modify tables, diagrams, and charts.
8. Insert and modify hyperlinks in all types of documents.
9. Create new documents and presentations using templates.
10. Save documents in appropriate formats for different uses.
11. Insert and format pictures, shapes, and graphics in a PowerPoint presentation.
12. Understand how to customize slide templates in a PowerPoint presentation.
13. Create a slide show for an oral presentation.
14. Demonstrate how to export a presentation to another Microsoft office program.
15. Enter and edit cell content when using Excel.
16. Insert and modify formulas when using Excel.
17. Create, modify, and position diagrams and charts based on worksheet data when using Excel.
18. Apply and modify cell formats and cell styles in Excel.
19. Create Access databases.
20. Create and modify queries, forms, and reports using Access.
21. Import data to Access and export data from Access.
22. Demonstrate how to back up a database.
23. Identify individual work habits and ethics and explain their importance in the workplace.
24. Research and analyze career opportunities for an individual that has the MOS/MCAS certification and develop an electronic employment portfolio.
25. Demonstrate employability and soft skills relative to the career cluster.
26. Apply math and communication skills within the technical content.

Multimedia Publishing 060751

This hands-on course applies publishing and presentation concepts through the development of sophisticated business documents and projects. These documents include, but are not limited to, tri-fold brochures, manuscripts, reports, bi-fold programs, catalogs, newsletters, flyers, business forms, graphs, web pages, on-screen presentations, and video productions. Equipment such as scanners, digital cameras, video cameras, and color laser printers may be utilized in creating the documents. Formatting, editing, page layout, and design concepts are taught. Distribution ready publication standards are applied to all projects. Students will develop communication skills, problem-solving techniques, cooperative learning, and interpersonal skills. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Prerequisite: Digital Literacy 060112

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply language rules and proofreaders' marks, and use reference materials along with style, grammar, and spellcheck.
2. Define and apply terminology associated with desktop publishing, layout, and design.
3. Research and analyze career opportunities in multimedia publishing and graphic arts.
4. Use industry-standard hardware and software components of a multimedia publishing system such as digital cameras, scanners, and video cameras.
5. Apply basic HTML and a software package to create a web page.
6. Compose and design effective business publications and documents.
7. Develop multimedia presentations including slide show, video, and audio.
8. Design page layout with appropriate proportions, balance, and typography.
9. Demonstrate the ability to use the Internet.
10. Use business graphics and paint, draw, and image-editing programs.
11. Design FBLA (Future Business Leaders of America) and/or DECA documents using effective multimedia publishing skills.
12. Demonstrate employability and soft skills relative to the career cluster.
13. Apply math, science, and communication skills relative to the career major.

Office Administration 070743

This course is designed to provide students an advanced level of experiences that will propel them into the 21st century business world as they serve in positions such as college interns, administrative assistants, graduate assistants, and assistant managers. While using high levels of technology learned in previous classes, students will be taught fundamental business procedures such as records management, human resource management, time management software, workstation management, travel planning, financial reporting, payroll, mail procedures, effective communication skills, and ethical decision making skills. A heavy emphasis will be placed on employability skills. Students should regularly be using word processing, spreadsheet, presentation, database, desktop publishing, and email software. This course should be considered the capstone course in its career pathway and is designed for upper-classmen only. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Identify, describe, and use different types of electronic communications and apply business communications and netiquette skills to create, send, receive, and reply to electronic communication including e-mail and telephone.
2. Demonstrate employability and soft skills relative to the career cluster including cell phone, Internet netiquette, introductions, and grammar.
3. Compose and illustrate an oral report using appropriate visual aids.
4. Demonstrate advanced computer applications to create, edit, save, revise, and print word processing documents, spreadsheets and related charts, database files, reports, and presentations.
5. Show advanced software integration skills to create new documents through the use of word processing, spreadsheets and related charts, database files, reports, and presentations.
6. Demonstrate advanced skills to design, create, edit, save, and print desktop publishing documents which include text, graphics, borders, shadings, watermarks, columns, and nameplates using principles of layout and design.
7. Demonstrate advanced skills to utilize the mail merge feature of a software program.
8. Demonstrate advanced skills to apply financial and database functions to spreadsheets including formulas, data tables, sorting, and queries.
9. Demonstrate advanced skills using a spreadsheet program to create and work with templates, wizards, and multiple spreadsheets and workbooks.
10. Demonstrate advanced skills using a database program to create enhanced reports.
11. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.

12. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
13. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
14. Develop projects using a variety of software applications.
15. Analyze various hardware, software, operating systems, and emerging technologies used by business and industry such as speech recognition and personal digital assistants.

Personal Finance (CTE Credit) 060170

The goal of the Personal Finance course is to help students to become financially responsible, conscientious members of society. To that end, this course develops student understanding and skills in such areas as money management, budgeting, financial goal attainment, the wise use of credit, insurance, investments, and consumer rights and responsibilities. Throughout the course, students also examine contemporary, real-world ethical dilemmas that individuals commonly encounter when managing their personal finances. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Explore the regulatory environment of United States' businesses to understand the diversity of regulations.
2. Acquire knowledge of economic concepts to understand their impact on wealth management.
3. Understand the fundamental principles of money needed to make financial exchanges.
4. Analyze financial needs and goals to determine financial requirements.
5. Explore methods of generating income to achieve financial goals.
6. Manage personal finances to achieve financial goals.
7. Understand the use of financial-services providers to aid in financial-goal achievement.
8. Use investment strategies to ensure financial well-being.
9. Use risk management products to protect a business's financial well-being.
10. Utilize sources of securities information to make informed financial decisions.
11. Identify potential threats and opportunities to protect financial well-being.
12. Acquire self-development skills to enhance relationships and improve efficiency in the work environment.
13. Utilize critical-thinking skills to determine best options/outcomes.
14. Complete on-boarding activities to fulfill government and employer requirements.
15. Acquire product knowledge to communicate product benefits and to ensure appropriateness of product for the client.
16. Discuss consumer rights.
17. Describe consequences associated with decision-making.
18. Discuss how people react to incentives.
19. Explain the impact of limited resources on wealth management.
20. Describe the role of institutions in helping individuals and groups accomplish their goals.
21. Discuss the impact of inflation on personal finance.
22. Explain forms of financial exchange (cash, credit, debit, and electronic funds transfer).
23. Identify types of currency (coins, paper money, and banknotes)
24. Describe functions of money (medium of exchange, unit of measure, store of value, and incentive).
25. Explain the time value of money.
26. Calculate interest.

27. Explain the purposes and importance of credit.
28. Explain legal responsibilities associated with financial exchanges.
29. Explain the need to save and invest.
30. Determine personal net worth.
31. Set financial goals.
32. Develop personal budget.
33. Describe sources of income (wages/salaries, interest, rent, dividends, transfer payments, gift funds, and inheritances).
34. Discuss types of loans (mortgages and auto loans).
35. Complete loan applications.
36. Explain the nature of tax liabilities.
37. Interpret a pay stub.
38. Prepare bank account documents (checks, deposit/withdrawal slips, and endorsements).
39. Maintain financial records.
40. Reconcile bank statements.
41. Pay bills.
42. Manage online accounts.
43. Contest incorrect bills.
44. Explain the nature of charitable giving.
45. Demonstrate the wise use of credit.
46. Validate credit history.
47. Protect against identity theft.
48. Control debt.
49. Prepare personal income tax forms.
50. Determine how to pay for education.
51. Describe types of financial-services providers.
52. Discuss considerations in selecting a financial-services provider.
53. Explain types of investments.
54. Discuss the nature of retirement planning.
55. Explain how to cope with volatile financial markets.
56. Describe sources of securities information.
57. Read/Interpret securities tables.
58. Describe the concept of insurance.
59. Determine insurance needs.
60. Establish a financial safety net.
61. Explain the nature of estate planning.
62. Maintain appropriate personal appearance.
63. Demonstrate systematic behavior.
64. Set personal goals.
65. Make responsible financial decisions.
66. Explain the nature of bonds.
67. Explain the nature of stocks.
68. Describe the nature of mutual fund.
69. Acquire knowledge of securities products and benefits to support workplace activities.

Personal Finance (Math Credit) 080719

The goal of the Personal Finance course is to help students to become financially responsible, conscientious members of society. To that end, this course develops student understanding and skills in such areas as money management, budgeting, financial goal attainment, the wise use of credit, insurance, investments, and consumer rights and responsibilities. Throughout the course, students also examine contemporary, real-world ethical dilemmas that individuals commonly encounter when managing their personal finances. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Explore the regulatory environment of United States' businesses to understand the diversity of regulations.
2. Acquire knowledge of economic concepts to understand their impact on wealth management.
3. Understand the fundamental principles of money needed to make financial exchanges.
4. Analyze financial needs and goals to determine financial requirements.
5. Explore methods of generating income to achieve financial goals.
6. Manage personal finances to achieve financial goals.
7. Understand the use of financial-services providers to aid in financial-goal achievement.
8. Use investment strategies to ensure financial well-being.
9. Use risk management products to protect a business's financial well-being.
10. Utilize sources of securities information to make informed financial decisions.
11. Identify potential threats and opportunities to protect financial well-being.
12. Acquire self-development skills to enhance relationships and improve efficiency in the work environment.
13. Utilize critical-thinking skills to determine best options/outcomes.
14. Complete on-boarding activities to fulfill government and employer requirements.
15. Acquire product knowledge to communicate product benefits and to ensure appropriateness of product for the client.
16. Discuss consumer rights.
17. Describe consequences associated with decision-making.
18. Discuss how people react to incentives.
19. Explain the impact of limited resources on wealth management.
20. Describe the role of institutions in helping individuals and groups accomplish their goals.
21. Discuss the impact of inflation on personal finance.
22. Explain forms of financial exchange (cash, credit, debit, and electronic funds transfer).
23. Identify types of currency (coins, paper money, and banknotes).
24. Describe functions of money (medium of exchange, unit of measure, store of value, incentive.
25. Explain the time value of money.
26. Calculate interest.

27. Explain the purposes and importance of credit.
28. Explain legal responsibilities associated with financial exchanges.
29. Explain the need to save and invest.
30. Determine personal net worth.
31. Set financial goals.
32. Develop personal budget.
33. Describe sources of income (wages/salaries, interest, rent, dividends, transfer payments, gift funds, and inheritances).
34. Discuss types of loans (mortgages and auto loans).
35. Complete loan applications.
36. Explain the nature of tax liabilities.
37. Interpret a pay stub.
38. Prepare bank account documents (checks, deposit/withdrawal slips, and endorsements).
39. Maintain financial records.
40. Reconcile bank statements.
41. Pay bills.
42. Manage online accounts.
43. Contest incorrect bills.
44. Explain the nature of charitable giving.
45. Demonstrate the wise use of credit.
46. Validate credit history.
47. Protect against identity theft.
48. Control debt.
49. Prepare personal income tax forms.
50. Determine how to pay for education.
51. Describe types of financial-services providers.
52. Discuss considerations in selecting a financial-services provider.
53. Explain types of investments.
54. Discuss the nature of retirement planning.
55. Explain how to cope with volatile financial markets.
56. Describe sources of securities information.
57. Read/Interpret securities tables.
58. Describe the concept of insurance.
59. Determine insurance needs.
60. Establish a financial safety net.
61. Explain the nature of estate planning.
62. Maintain appropriate personal appearance.
63. Demonstrate systematic behavior.
64. Set personal goals.
65. Make responsible financial decisions.
66. Explain the nature of bonds.
67. Explain the nature of stocks.
68. Describe the nature of mutual funds.
69. Acquire knowledge of securities products and benefits to support workplace activities.

Principles of Entrepreneurship 080310

Principles of Entrepreneurship (Standard) introduces students to a wide array of entrepreneurial concepts and skills, including the role of entrepreneurship in our economy, entrepreneurial discovery processes, ideation, and preliminary start-up venture planning. Students also develop an appreciation for marketing's pivotal role in the development and success of a new business. They become acquainted with channel management, pricing, product/service management, and promotion. Students conduct thorough market planning for their ventures: selecting target markets; conducting market, SWOT, and competitive analyses; forecasting sales; setting marketing goals and objectives; selecting marketing metrics; and setting a marketing budget. The capstone activity in the course is the development of detailed marketing plans for students' start-up businesses. Throughout the course, students are presented ethical dilemmas and problem-solving situations for which they must apply academic and critical-thinking skills. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Marketing Principles 080716 **OR** Business and Marketing Essentials 060111

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Apply knowledge of business ownership to establish and continue business operations.
2. Acquire foundational knowledge of channel management to understand its role in marketing.
3. Manage channel activities to minimize costs and to determine distribution strategies.
4. Understand the nature of business to show its contributions to society.
5. Understand economic systems to be able to recognize the environments in which businesses function.
6. Acquire knowledge of the impact of government on business activities to make informed economic decisions.
7. Understand fundamental factors about entrepreneurship to recognize its role and importance in the economy.
8. Employ entrepreneurial discovery strategies to generate feasible ideas for business ventures.
9. Develop concept for new business venture to evaluate its success potential.
10. Develop marketing strategies to guide marketing tactics.
11. Select target market appropriate for product/business to obtain the best return on marketing investment (ROMI).
12. Employ marketing-information to plan marketing activities.
13. Acquire information to guide business decision-making.
14. Participate in career planning to enhance job-success potential.
15. Develop a foundational knowledge of pricing to understand its role.
16. Employ pricing strategies to determine optimal pricing.

17. Acquire a foundational knowledge of product/service management to understand its nature and scope.
18. Employ product-mix strategies to meet customer expectations.
19. Position products/services to acquire desired business image.
20. Acquire a foundational knowledge of promotion to understand its nature and scope.
21. Understand promotional channels used to communicate with targeted audiences.
22. Plan marketing communications to maximize effectiveness and to minimize costs.
23. Utilize planning tools to guide organization's/department's activities.

Principles of Hospitality 080910

This course is designed for students interested in marketing careers in the hospitality industry. The instruction includes career awareness in the areas of recreation, travel/tourism, hotel/motel, and restaurant. This course is based on the business and marketing core that includes communication skills, economics, operations, promotion, selling, and product/service management. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Describe the evolution and current trends in the hospitality industry.
3. Identify and describe the segments found in the hospitality, travel, tourism, and recreation industry.
4. Describe social, environmental, economic, and business factors related to the hospitality industry.
5. Develop customer-service skills, employee/employer relations and other interpersonal skills.
6. Identify advantages and disadvantages of working in the hospitality industry.
7. Describe the concept of the economic multiplier in the hospitality industry.
8. Illustrate the channels of distribution unique to the hospitality industry.
9. Determine the roles and functions of individuals engaged in facilities management and maintenance careers.
10. Illustrate the management of hospitality, travel, tourism, and recreation programs and events.
11. Describe the types of promotional strategies and media used in the hospitality industry.
12. Apply math and communication skills within the technical content.
13. Identify the concept of marketing mix and market segmentation as it relates to the hospitality industry.
14. Research career opportunities, job responsibilities, and employment requirements in the hospitality industry.
15. Identify individual work habits and ethics such as individual/team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills. Explain their importance in the workplace.
16. Utilize safety and sanitation practices as applied to the industry.

Promotional Applications and Media 081512

This course is designed to provide students with hands-on applications of running a school-based industry simulated experience. Students will apply basic fundamentals of advertising using digital and print media. This course is based on the business and marketing core that includes communication skills, economics, financial analysis, product and service management, and promotion. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Demonstrate an understanding of digital media.
3. Utilize digital audio, digital video, the World Wide Web, and other technologies that can be used to distribute digital content.
4. Prepare a graphic presentation that describes and gives examples of the elements of the promotional mix.
5. Research the development of internet advertising such as e-mails, portals, and banner ads over the past decade.
6. Demonstrate a fundamental knowledge of marketing concepts and promotional media as they relate to a specific business.
7. Analyze the promotional mix of various businesses and make recommendations for media selections.
8. Develop a one-year budget for promotional media based on anticipated sales.
9. Identify misleading or deceptive advertising practices.
10. Demonstrate how to select and use appropriate media software to promote products or services.
11. Develop a website for a school-based enterprise.
12. Create a 15 second video advertising the school-based enterprise.
13. Apply advertising fundamentals in developing a print ad for the school newspaper.
14. Produce a slide show from a storyboard using text, graphics, and sound with appropriate transition and effects.
15. Analyze how advertising and promotion jobs have changed due to scientific advancement and increased use of technology.
16. Apply math and communications skills needed in the advertising and promotion industry.
17. Identify individual work habits and ethics such as individual and team skills, confidentiality, problem solving, punctuality, self-discipline, and communication skills. Explain their importance in the workplace.

Retail Marketing 081411

This course is designed to provide an overview of the marketing responsibilities of individuals employed in the retail industry. This course is based on the business and marketing core that includes communication skills, operations, distribution, marketing-information management, pricing, product and service management, promotion, and selling. The Kentucky Occupational Retail Services Skill Standards are integrated into this course giving students the opportunity to receive Retail Skill Standards Certification. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Identify career opportunities available I the four major employment areas of sales: retail, wholesale, manufacturing and service.
3. Identify positive contributions of selling in our market-oriented economy.
4. Identify types of retailers such as brick-and-mortar and e-commerce.
5. Investigate successful retailers of the past and present.
6. Identify and determine business risk factors.
7. Formulate awareness and understanding of emerging trends and globalization in retailing.
8. Explain when and how to buy merchandise for a retail store.
9. Identify aspects of product and service planning like packaging, warranties, and selecting the right product mix.
10. Explain the factors affecting pricing decisions including legal considerations and competition.
11. Conduct a physical inventory of a school-based enterprise, marketing department, or local retail store.
12. Develop spreadsheets and utilize other computer software for the purpose of controlling and tracking inventory.
13. Apply economic concepts like supply and demand, competition, scarcity, and opportunity costs.
14. Compare products and services based on price, quality, features, and warranties to understand consumer decision making.
15. Develop customer-service skills and practice in role play situations.
16. Demonstrate the selling process including open the sale, question, handle objections, present features and benefits, suggestive selling, close, and follow-up.
17. Develop spreadsheets and utilize other computer software for the purpose of measuring sales and making decisions from information gathered.
18. Develop a research tool as a part of a marketing research project.
19. Develop a promotion plan after examining each part of the promotional mix.
20. Identify risk management techniques related to employees, safety, security, and loss prevention.

21. Research career choices in retailing and match with personal goals.
22. Create a career portfolio including a resume, letters of reference, certifications of training, and samples of work.
23. Identify individual work habits and ethics including individual and team skills, confidentiality, problem solving, and punctuality. Explain their importance in the workplace.
24. Demonstrate skills needed for effective personal financial planning including budgeting, investing, consumerism, and credit management.
25. Apply math and communication skills within the technical content.

Retail Marketing Management 081431

This course is designed as a continuation of Retail Marketing and provides an in-depth study of merchandising techniques and management skills. This course is based on the business and marketing core that includes communication skills, economics, operations, professional development, promotion, selling, distribution, and product/service management. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Suggested Prerequisite: Retail Marketing 081411

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Research the structure of business ownership and explain considerations in business planning.
2. Identify and explain basic functions of management, management styles, criteria used in setting and achieving goals, leadership characteristics, and procedure for monitoring and evaluating employer performance.
3. Research and analyze career opportunities in management.
4. Develop a career portfolio including a resume, letter of application, certificates of training, and samples of work.
5. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
6. List and describe typical channels of distribution utilized in retail marketing.
7. Demonstrate an understanding of forecasting sales, calculating financial ratios, explaining the nature of operating budgets, and developing company's/department budgets.
8. Define market segmentation and describe its relationship to target marketing.
9. Analyze the buying of merchandise for retail sale and the different merchandising procedures that could be used.
10. Prepare a buying plan and calculate open-to-buy based on cost and retail for selected products in an identified business.
11. Explain the selling process and the nature of sales management.
12. Explain the nature of product branding and develop strategies to position product/business.
13. Develop a promotion plan with a budget for a retail business.
14. Apply math and communication skills needed in operating a retail business.
15. Utilize activities in DECA as an integral component of course content and leadership development.
16. Demonstrate employability and soft skills relative to working in a retail business.
17. Identify individual work habits and ethics such as individual/team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills. Explain their importance in the workplace.

Sports and Event Marketing 081121

This sport/event marketing course develops student understanding of the sport/event industries, their impact on local communities, and products; distribution systems and strategies; pricing considerations; marketing-information management; selling; product/service management, and promotion. Students acquire an understanding and appreciation of the need for planning. Throughout the course, students are presented problem-solving situations for which they must apply academic and critical-thinking skills. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Resolve conflicts with/for customers to encourage repeat business.
2. Understand sport/event marketing's role and function in business to facilitate economic exchanges with customers.
3. Implement organizational skills to improve efficiency and workflow.
4. Utilize project-management skills to improve workflow and minimize costs.
5. Acquire information about the sport/event industry to aid in making career choices.
6. Acquire foundational knowledge of marketing-information management to understand its nature and scope.
7. Understand data-collection methods to evaluate their appropriateness for the research problem/issue.
8. Collect secondary marketing data to ensure accuracy and adequacy of information for decision-making.
9. Select target market appropriate for product/business to obtain the best return on marketing investment.
10. Develop a foundational knowledge of pricing to understand its role in marketing.
11. Employ product mix strategies to meet customer expectations.
12. Position product/services to acquire desired business image.
13. Position company to acquire desired business image.
14. Understand promotional channels used to communicate with targeted audiences.
15. Understand the use of an advertisement's components to communicate with targeted audiences.
16. Understand the use of direct marketing to attract attention and to build brand.
17. Develop content for use in marketing communications to create interest in product/business/idea.
18. Manage media planning and placement to enhance return on marketing investment.
19. Utilize publicity to inform stakeholders of business activities.
20. Employ sales-promotion activities to inform or remind customers of business/product.
21. Acquire product knowledge to communicate product benefits and to ensure appropriateness of product for the customer.
22. Perform pre-sales activities to facilitate sales presentation.

23. Employ sales processes and techniques to enhance customer relationships and to increase the likelihood of making sales.
24. Process the sale to complete the exchange.

Touch Keyboarding 060114

This is a six-to-nine week course where students will develop skills in operating a keyboard by touch with emphasis on entering the alphabet, numbers, and symbols with proper technique.

Recommended Grade Level: 4 - 6

Recommended Credit: N/A

Students will:

1. Demonstrate proper keyboarding technique.
2. Apply formatting to simple documents such as letters, reports, and articles.
3. Apply standard rules of spelling, punctuation, grammar, and capitalization.
4. Organize and maintain workstation.

Travel and Tourism Marketing 080911

This course introduces the student to the travel and tourism industry. This course is based on the business and marketing core that includes communication skills, economics, human resource management, promotion, marketing-information management, and selling. Instruction includes domestic and international travel, sales techniques, transportation methods, food and beverage marketing, and destination marketing. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Identify and describe the career opportunities, job responsibilities, and employment requirements in the travel and tourism industry.
3. Describe the qualifications of a travel consultant and the services they provide.
4. Contrast the advantages of proprietorship, partnership or corporation as an organizational structure for a travel agency.
5. Describe the impact travel and tourism has on the local, state, and national economy.
6. Identify the concept of marketing mix and marketing segmentation as it related to the travel and tourism industry.
7. Describe the current trends in the travel and tourism industry.
8. Identify and describe major businesses found in travel and tourism.
9. Describe social, environmental, economic, and business factors that impact travel and tourism.
10. Describe the types of products and services hotel and lodging facilities offer to the business travel market.
11. Describe the types of promotional strategies used in the travel and tourism industry.
12. Identify factors that impact the profit margin of different types of businesses in the travel and tourism industry.
13. Outline the type of marketing research that should be conducted prior to developing a marketing plan for a selected hotel.
14. Identify trends in the use of technology in the travel and tourism industry.
15. Apply math and communication skills within the technical content.
16. Identify key travel and tourism web sites that provide up-to-date information.
17. Identify individual work habits and ethics such as individual/team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills. Explain their importance in the workplace.
18. Research travel destinations exploring a variety of geographic locations and identify their cultural differences.

Web Page Design 060199

Students analyze the structure of the worldwide web, apply basic principles of web documents and HTML, and develop multi-media web pages. Course content will include the understanding of hypertext and web structures. Equipment such as scanners, digital and video cameras, and sound recording devices will be utilized through hands-on instruction. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Prerequisite: Digital Literacy 060112

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Analyze the history and current status of the Internet.
2. Identify concepts and vocabulary associated with the Internet.
3. Demonstrate an awareness of copyright, licensing, and downloading issues.
4. Identify and apply design principles of web page structures.
5. Create HTML documents using tags, files, links, tables, frames, forms, images, and text.
6. Use a software package to create a multimedia web page with dynamic content such as the incorporation of sound files, digital photography, video files, and images into a web page.
7. Identify browser restrictions.
8. Analyze, create, and organize navigational links.
9. Implement CGI and JavaScript programming.
10. Demonstrate Internet etiquette.
11. Explore and evaluate career opportunities in electronic publishing.
12. Observe and practice safety precautions applicable to both classroom and home use of the Internet.
13. Publish web pages to a web server.
14. Formulate a user-friendly file structure for web publishing.

CONSTRUCTION TECHNOLOGY

AIR CONDITIONING TECHNOLOGY PATHWAYS

Construction Track CIP 46.0000.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer, and the student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits.

A minimum of four (4) courses chosen from the partnering technical center's construction course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK website.

Environmental Control System Technician CIP 47.0201.05

This pathway prepares individuals to apply technical knowledge and skills to repair, install, service and maintain the operating condition of heating, air conditioning, and refrigeration systems. The pathway includes instruction in diagnostic techniques, the use of testing equipment and the principles of mechanics, electricity, and electronics as they relate to the repair of heating, air conditioning and refrigeration systems.

BEST PRACTICE COURSES

Complete (4) four credits.

- 460828 Refrigeration Fundamentals
- 460817 HVAC Electricity
- 460826 Electrical Components
- 460820 Heating and Humidification

Completion of the above four (4) courses will allow the student to take the "Kentucky Journeyman HVAC Mechanic" exam. After successful completion of the exam, the student will attain 750 hours of the 3000 hours of "On the Job Training (OJT) required by regulation 815 KAR 8:030 Section 3.

AIR CONDITIONING TECHNOLOGY COURSES

Commercial Refrigeration 460822

This course develops techniques for servicing and troubleshooting mechanical and electromechanical refrigeration components. Electrical and refrigeration safety are emphasized. Proper tool use and environmentally sound refrigerant handling are taught.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Safety:
    a. Practice and observe safety practices and procedures.
2. Metering Devices:
    a. Define types of metering devices: capillary tubes, TXV, AEV, low side float, high side float, hand expansion valve, restrictor orifices.
    b. Evaluate system performance when using different types of flow control devices.
    c. Adjust and size devices when and where appropriate.
    d. Verify system operation.
3. Compressors and Compression:
    a. Identify types of compressors: hermetic, open type, and semi-hermetic.
    b. Identify methods of compression: centrifugal, rotary, screw, scroll, and reciprocating.
    c. Select the compressor based on cooling load.
    d. Explain the methods of compression.
    e. Explain methods of unloading cylinders (capacity control).
4. System Components and Accessories:
    a. Determine the system balance based on the selected components.
    b. Properly identify the location of all accessories in a refrigeration system.
    c. Determine appropriate accessories for systems application.
    d. Explain the operation of the accessories in a refrigeration system.
    e. Adjust EPR valve.
    f. Check the CPR valve.
5. Piping:
    a. Calculate pressure drop in liquid line risers.
    b. Size double risers.
    c. Size hot gas line.
    d. Size liquid line from condenser to receiver.
    e. Explain the multiplex system.
    f. Explain the cascade system.
    g. Determine capacities of refrigerant lines.
    h. Determine equivalent lengths of fittings.
    i. Calculate total effective length of pipe runs.
6. Troubleshooting and Service:

a. Explain how to set superheat on a multiplex system.
b. Explain the heat reclaim cycle (three way valve).
c. Explain the head pressure control system (flooded condenser).
d. Adjust EPR valve.
e. Check control circuits according to manufacturer's specifications.
f. Check system for full refrigerant charge.
g. Explain the difference between medium temperature, low temperature, and ultra-low temperature storage systems.
h. Explain the operation of: air screen freezer, glass door freezer, and coffin cases.
i. Explain the different methods of defrost: electric resistance, hot gas, and cool gas.
j. Replace anti-sweat heaters.
k. Replace fan motors and fans.
l. Check and/or replace fan relay.
m. Verify air flow.
n. Demonstrate good customer relations.
o. Read electrical wiring diagrams and demonstrate understanding of wiring diagrams.
p. Develop a systematic way to diagnose system problems and demonstrate in class.
q. Determine cause of failure in system components.
r. Identify and describe possible causes of failure and how to eliminate causes.
s. Demonstrate use of tools and test equipment while following safety practices.
t. Verify system operation.
u. Write service report.

Cooling and Dehumidification 460824

This course will explain the working characteristics of air conditioning units with air and water cooled condensers. Line, low voltage, and pneumatic controls will also be covered. ARI – Air Conditioning Systems: Subtopics A-E; System Installation and Start-Up: Subtopic D; System Servicing and Troubleshooting: Subtopic D; and Controls: Subtopic will also be covered.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Safety:
    a. Practice and observe safety procedures and techniques.
    b. Explain the importance of manufacturers' installation and operation techniques.
    c. Check system operation while following all safety procedures.
    d. Follow local codes and ordinances during installation and repair.
    e. Demonstrate the use of tools and test equipment while following safety practices.
2. Air Conditioning:
    a. Describe air conditioning.
    b. List the benefits of conditioned air.
    c. Describe some of today's current issues regarding air conditioning – industry concerns and future ramifications.
    d. Describe the difference between split systems and package systems.
    e. Describe the sequence of the basic refrigeration cycle and operation of the air conditioning system.
    f. Use and read various tools and instrumentation needed for checking, testing and operating air conditioning systems and appropriately diagnose the electrical and/or mechanical problems.
3. Cooling and Dehumidification:
    a. Define the types of condensers: air cooled, water cooled, and evaporative.
    b. Adjust the air flow for proper temperature difference.
    c. Describe maintenance of a condenser and a cooling tower.
    d. Demonstrate good customer relations in a classroom simulation.
    e. Determine equipment electrical components including control components.
    f. Verify equipment air flow and distribution requirements.
    g. Check operation of all electrical components including control components.
    h. Demonstrate the use of tools and test equipment.
    i. Read and demonstrate understanding of electrical wiring diagrams.
    j. Develop a systemic way to diagnose system problems and demonstrate in class.
    k. Determine the cause of failure in a system.
    l. Identify and describe possible causes of failure and how to eliminate.
    m. Verify system operation.
    n. Write a service report.
    o. Identify types of control systems: electromechanical, pneumatic, electronic, and programmable.

p. Identify control system components.
q. Describe the sequences of operation in all types of control systems.
r. Construct a schematic diagram using all components necessary to safely operate an air conditioner.
s. Program a programmable thermostat for heating, cooling, and heat pump operation including set up and set back.
t. Plot and chart psychrometric terms.

Co-Op (Air Conditioning) 460880

Co-op I provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance educational expenses.

Electrical Components 460826

This course defines the electrical components of an air conditioning system. Different types of line voltages, wiring diagrams, and solid-state devices are included. Safety is emphasized.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. HVAC (Heating, Ventilation, and Air Conditioning) Principles, Terminology, and Safety:
    a. Define basic terminology used in the HVAC (Heating, Ventilation, and Air Conditioning) industry.
    b. Describe the various types of tools and equipment used in HVAC (Heating, Ventilation, and Air Conditioning) and their proper use. Follow approved safety procedures.
    c. Explain the procedure for lockout/tagout system.
2. Electrical:
    a. Discuss electrical safety procedures and techniques.
    b. Explain the physics of electricity and electrical circuits.
    c. Identify the various types of single phase and three phase components.
    d. Explain how to use and read various instruments needed for checking and testing electrical circuits and components.
    e. Explain how to use and read various instruments needed for checking and testing electrical circuits and components.
3. Plan Analysis:
    a. Throughout the program, identify universal symbols used in equipment manuals and building and mechanical plans.
4. Electrical Components:
    a. Practice/Observe safety procedures/techniques.
    b. Measure voltage with digital and analog voltmeters.
    c. Measure AC current with a clamp-on ammeter.
    d. Check winding insulation with a megohmmeter.
    e. Define watts, ohms, volts, amps.
    f. Define and compare single and multi-phase voltage and current.
    g. Demonstrate proper use of ohmmeter, ammeter, and voltmeter (voltage, ohms, capacitance, and micro amps).
    h. Calculate electrical circuit loads.
    i. Use appropriate meters to check fuses and breakers.
    j. Interpret tables and charts from National Electrical Code (NEC).
    k. Figure wire sizes and voltage drop.
    l. Draw and identify power transformer types.
    m. Size and test fuses and breakers and safely replace them.
    n. Use NEC (National Electric Code) tables to size conduit.

o. Define relays, sequencers, contactors, capacitors, defrost timers, crankcase heaters, water valves, damper actuators, thermostats, controllers, rheostats, zone valves, and solenoids.
p. Explain the operation and application of: split-phase motors, three-phase motors, variable-speed motors, shaded-pole motors, and permanent-split capacitor motors.
q. Demonstrate proper use of testing equipment for motors.
r. Interpret detailed instructions for wiring circuits.
s. Draw electrical circuits in accordance with standard wiring procedures.
t. Wire actual electrical circuits from wiring diagrams.
u. Explain the use of various electrical components in HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration).
v. Interpret schematic wiring diagrams into a sequence of operation for HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration) equipment.
w. Rewire a HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration) unit using a schematic diagram.
x. Develop an approved routine for electrical troubleshooting.

Green Awareness/Energy Management 460806

This course will instruct students in the areas of energy management and analysis, green heating, ventilation, air conditioning and refrigeration. It will also cover electrical generation and consumption as well as green plumbing.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Safety:
    a. Review safety rules and student responsibilities.
2. Energy consumption:
    a. Discuss core renewable energy and sustainable energy.
    b. Discuss commercial building energy consumption surveys.
    c. Explain different energy conservation measures.
    d. Discuss the importance of energy audits.
    e. Explain energy consumption and demand analysis.
    f. Introduce heat load calculations.
    g. Discuss lighting florescence versus LED.
    h. Explain ghost loads.
    i. Review and discuss residential appliance energy usage.
    j. Introduce potable water conversation flow restriction faucets, showerheads pre-rinse waterless urinals.
    k. Discuss high efficiency plumbing appliances: clothes washers, dishwashers, ice machines, garbage disposals.
    l. Explain first hour rating system.
    m. Explain drain water heat recovery systems.
    n. All students will take the Green Mechanical Certification Exam.
3. HVAC (Heating, Ventilation, and Air Conditioning) Systems and Equipment:
    a. Explain life equipment, life cycle, and cost analysis.
    b. Cover HVAC (Heating, Ventilation, and Air Conditioning) energy efficiency ratio.
    c. Discuss HVAC (Heating, Ventilation, and Air Conditioning) seasonal energy efficiency ratio SEER.
    d. Discuss HVAC (Heating, Ventilation, and Air Conditioning) heating season performance factors.
    e. Explain HVAC (Heating, Ventilation, and Air Conditioning) coefficient of performance.
    f. Discuss and test HVAC (Heating, Ventilation, and Air Conditioning) ventilation and indoor air quality.
    g. Review mechanical HVAC (Heating, Ventilation, and Air Conditioning) equipment.
    h. Discuss evaporative cooling and passive cooling systems.
    i. Explain solar cooling and thermal storage systems.

    j. Review heating combustion analysis.
    k. Review forced air heating systems.
    l. Review condensing furnaces and modulating furnaces.
    m. Explain condensing boilers and instantaneous boilers.
    n. Review geothermal systems and air to air heat pumps.
    o. Review package terminal air conditioning.
    p. Review mini-split AC systems.
    q. Explain industrial fire protection systems and residential fire protection systems.
4. Refrigeration Equipment:
    a. Introduce commercial refrigeration and U.S. EPA Green Chill Advanced Refrigeration Partnership.
    b. Discuss refrigeration replacement equipment.
5. Hot Water Systems and Equipment:
    a. Explain solar hot water and comfort heating systems.
    b. Discuss waste water heat recovery.
    c. Discuss radiant panel systems and thermal mass.
    d. Explain optimized steam systems and steam traps.
    e. Introduce hot water distribution systems.
    f. Introduce hot water circulating systems.
    g. Explain different types of water heating systems storage tank, tank less, heat pump water heaters, indirect, and solar.
    h. Explain rain water harvesting.
    i. Explain green plumbing systems relevance to LEED.
6. Power Sources:
    a. Define and discuss electrical power and nuclear power.
    b. Explain fuel cells.
    c. Introduce photovoltaic and wind turbines as power sources.
    d. Explain tidal and ocean energy applications.

Heat Load/Duct Design 480812

Introduces the fundamentals needed to calculate heat gain and heat loss, thereby determining air conditioner/furnace size. This information will be used to calculate the correct duct size. Procedures to lay out a duct system as outlined in ACCA MANUAL D are presented.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Terminology:
    a. Define "U" value.
    b. Define "R" value.
    c. Interpret heat transfer tables ("U", "R").
    d. Calculate total heat transfer valve of any surface (R) - (U).
    e. Explain: specific humidity, apparatus dew point, contact factor, relative humidity, dry-bulb, wet-bulb, dew point, and enthalpy.
2. Manual "J" Heat Loss Gain:
    a. Explain the heat load sources, conduction, infiltration, product, and miscellaneous loads (people, motors, and equipment).
    b. Explain the purpose of vapor barriers.
    c. Interpret tables of specific heat values, latent heat, and heat of respiration.
    d. Calculate: refrigeration-sensible heat ratio, contact factor, latent heat, sensible heat, total heat, water removal, and mixed air conditions.
    e. Determine total resistance to heat flow ("R"), ("U").
    f. Interpret structure design data.
    g. Interpret building prints.
    h. Calculate conduction loss for: walls, roof, floors, windows, basement (walls, floor), and unconditioned space.
    i. Calculate infiltration: doors, windows.
    j. Calculate ventilation load.
    k. Calculate duct loss.
    l. Calculate "U" values for building materials.
    m. Calculate CLTD (Cooling Load Temperature Difference).
    n. Make corrections for CLTD.
    o. Calculate conduction loads for: walls, roofs, windows, doors, non-conditioned space, and floors.
    p. Calculate lighting load.
    q. Determine size of equipment needed.
    r. Calculate infiltration and ventilation.
    s. Calculate duct gain.
3. Manual "D" Duct Design:
    a. Draw layout of return and supply runs.
    b. Calculate equivalent length of trunk and branch ducts.
    c. Calculate total effective length of duct runs.

   d. Calculate total available static pressure.
   e. Size trunk and branch ducts by equal friction method.
   f. Use duct calculator to find duct size, velocity, CFM, and friction loss.
   g. Calculate air flow factors for heating and cooling.
   h. Size registers, grills, and diffusers.
4. Air Filtration:
   a. Identify types of mechanical filters: disposable, permanent foam, mesh, fiber, and high efficiency.
   b. Describe operation of electronic air cleaners.

Heat Pump Application 460801

This course explains reverse cycle heating systems, defrost cycles, reversing valves, and auxiliary heating. This course will also concentrate on the line and control voltage circuitry pertaining to these units. ARI Controls; Subtopic E; Heat Pump Systems: Subtopics A and B; System Installation and Start-Up: Subtopic C; System servicing and troubleshooting: Subtopic E.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Practice and observe safety procedures and techniques.
2. Explain the basic theory of heat pump operations.
3. Compare heat pump systems based on performance rating information: COP, SEER, balance points, economics.
4. Analyze and explain the refrigerant cycle in both heating and cooling modes.
5. Identify and describe different types of heat pump systems: air to air, water to air, water to air, water to water, air to water, air to ground, open loop, and closed loop.
6. Analyze and compare the operation and performance of the different types of heat pump systems.
7. Explain the operation and function of a reversing valve.
8. Identify the main types of defrost controls.
9. Explain the operation of each type of defrost control.
10. Describe the purpose and function of the outdoor thermostats.
11. Describe the sequence and purpose of emergency heat controls.
12. Describe the purpose and function of metering devices.
13. Install or replace a heat-sequencing relay.
14. Identify and explain the operation and function of the electrical and mechanical components of the heat pump.
15. Explain the importance of manufacturers' installation and operation requirements.
16. Determine equipment electrical requirements.
17. Verify equipment air flow and distribution.
18. Check operation of all electrical components.
19. Check system operation in the heating and cooling modes while following safety procedures.
20. Follow local codes and ordinances during installation and repair.
21. Read and demonstrate an understanding of electrical wiring diagrams.
22. Develop systematic way to diagnose system problems and demonstrate method in class.
23. Identify and describe all possible causes of failure and how to eliminate causes.
24. Use appropriate tools and test equipment while following safety practices.
25. Verify system operation.

Heating and Humidification 460820

This course explains heating systems from simple fossil fuel furnaces through more complex systems. This course will also concentrate on the line and control voltage circuitry pertaining to these systems. ARI Controls; Subtopics A-C; Heating Systems: Subtopics A-C; System Installation and Start-Up: Subtopics A and B; System Servicing and Troubleshooting: Subtopic C; Tools and Equipment: Subtopic D.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. HVAC (Heating, Ventilation, and Air Conditioning) Principles, Terminology, and Safety:
    a. Define basic terminology used in the HVAC (Heating, Ventilation, and Air Conditioning) industry.
    b. Discuss the relationship between heat, humidity, and human comfort.
    c. Describe the various types of tools and equipment used in HVAC (Heating, Ventilation, and Air Conditioning) and their proper use.
    d. Follow approved safety procedures.
2. HVAC (Heating, Ventilation, and Air Conditioning) Installation Requirements:
    a. Explain the relationship between mechanical codes and proper installation of HVAC (Heating, Ventilation, and Air Conditioning) equipment.
    b. Discuss installation requirements for duct systems, piping, and condensate disposal.
    c. Discuss techniques on the proper use of code books and reference manuals.
3. Gas Piping, Venting, Combustion Air:
    a. Explain the importance of the codes as they pertain to gas pipe safety.
    b. Explain how the codes affect the installation of piping and gas fired equipment.
    c. Identify the codes and standards applicable to proper venting techniques.
    d. Identify the life safety hazards of improper venting.
    e. Discuss and identify the codes related to determine proper combustion air.
4. Duct, Ventilation:
    a. Discuss the installation and safety considerations for the proper layout and construction of duct and fittings.
    b. Evaluate air distribution systems to determine proper air flow and duct leakage.
    c. Analyze and explain the importance of balancing a whole building ventilation system.
    d. Demonstrate knowledge of codes that relate to the installation of duct and ventilation system.
5. Heating and Humidification Safety:
    a. Practice/observe safety procedures and techniques.
    b. Perform safety lockout procedures for burners.
    c. Test a fan/limit control to identify a set point of control.
    d. Test all safety controls.
    e. Check ignition systems while following all safety principles.

    f. Use tools and test equipment appropriately while following safety practice.
6. Values:
    a. Check coil resistance of a valve coil.
    b. Test gas valve operation.
    c. Check the voltage at gas valve operator.
    d. Check pressure at inlet vs. outlet of gas valve.
    e. Explain the operation of a solenoid valve.
    f. Identify limited, non-adjustable and adjustable regulators.
    g. Determine application of gas valves.
    h. Check water-regulating valve operator.
    i. Discuss TXV valves and their operation.
7. Pilot Devices:
    a. Differentiate between pilot proving devices.
    b. Explain the operation of flame rod, mercury flame switch, bimetal, and millivolt flame sensors.
    c. Test and change a thermocouple flame sensor.
    d. Clean the pilot assembly.
8. Thermostats:
    a. Identify and install residential heating and cooling thermostats.
    b. Check and adjust the heat anticipator.
    c. Set aqua stat.
    d. Identify and design the difference between Communications and Non-Communications Thermostats.
    e. Set a Programmable Thermostat.
9. Furnace Gas System:
    a. Perform a regular conversion on a gas valve from natural gas to LP or reverse: low, line voltage, redundant, two-stage, and modulating.
    b. Test and adjust the fuel system of furnace.
    c. Measure gas pressure with a manometer.
    d. Adjust burner system to recommended efficiency.
    e. Perform pressure checks on the venting system.
    f. Adjust the regulator.
    g. Determine air velocity within a duct via: Pilot tube/magnehelic.
    h. Determine air velocity at grills and diffusers via: vane style anemometer, hot wire anemometer, pilot tube, and digital anemometer.
    i. Measure temperature difference across heating and cooling equipment.
    j. Verify equipment air flow and distribution requirements.
    k. Check operation of gas train components and measurements.
    l. Check for correct heating input and adjust to manufacturers' specifications.
    m. Demonstrate an understanding of combustion theory.
    n. Determine combustion air requirements.
    o. Verify system operation.
10. Heating:
    a. Test spark ignition modules.
    b. Wire a complete heating system – line and low voltage.
    c. Identify controls for heating and cooling.

d. Check the ignition system.
e. De-rate or change over a gas burner.
f. Check for proper temperature rise across the furnace.
g. Set proper air distribution in house.
h. Remove, install, and adjust blower motor and/or belt.
i. Adjust individual register outlets to properly balance system.
j. Demonstrate good customer relations in a classroom simulation.
k. Explain the importance of manufacturers' installation and operation requirements.
l. Determine equipment electrical requirements.
m. Check operation of all electrical control components.
n. Demonstrate use of tools and instruments.
o. Test for proper combustion.
p. Check electrical components for operation and wiring connections.
q. Read electrical wiring diagrams and demonstrate an understanding of wiring diagrams.
r. Develop a systematic way to diagnose system problems and demonstrate in class.
s. Determine cause of failure in a heating system.
t. Identify and describe all possible causes of failure and how to eliminate causes.
u. Write a service report.
v. Demonstrate good customer relations.

11. Cooling and Heat Pump (Super-heat and Sub-Cooling):
    a. Determine what type of Freon is in the system.
    b. Hook up refrigeration manifold to system.
    c. Start system and allow to settle reading on gauges.
    d. Install line temperature measurement probes.
    e. Read gauge pressure and saturation temperature.
    f. Read line temperature from thermometer on high and low side.
    g. Determine superheat (suction) and sub-cooling liquid.
    h. Demonstrate proper shutdown.
    i. Remove testing equipment properly.
    j. Restart equipment and put in normal operation.
12. Humidification:
    a. Wire a humidistat into electrical circuit.
    b. Determine the relative humidity using a sling psychrometer.
13. Fuel Oil:
    a. Measure resistance of a cad cell during operation.
    b. Check safety control for proper timed operation on shut down.
    c. Check oil burner components and measurements.
    d. Evaluate fuel supply systems.
    e. Change fuel oil filter.
    f. Clean oil pump strainer.
    g. Measure chimney draft with a draft gauge.
    h. Determine the efficiency of an oil pump using a vacuum gauge and a pressure gauge.
    i. Check for proper oil pressure at fuel pump.
    j. Remove drawer assembly and change nozzle and adjust ignitors.

k. Change oil pump coupler.
l. Install delay fuel oil valve.
m. Perform an efficiency test on an oil-gas burner: smoke test, CO2 test, and O2 test.
n. Set over the fire draft.
o. Set breech draft.

14. Boilers:
    a. Oil motors and bearings.
    b. Check circulator for alignment and lubrication.
    c. Check system for any gasket leaks at tankless and circulators.
    d. Remove air from water system.
    e. Inspect/change zone valve operator.
    f. Wire a multizone/multipump hydronic system.
    g. Identify types of hydronic piping systems.
    h. Observe proper draft conditions.
    i. Test boiler efficiency and clean if necessary.
    j. Set aqua stat.
15. Codes:
    a. Describe the reasons for codes.
    b. Discuss three model codes: Boca, standard, and uniform.
    c. Identify the codes and standards for the applicable area, locality, or state.
    d. Discuss the relationship between codes and manufacturers' installation instructions.
    e. Identify standards not covered by codes: AHRI (Air Conditioning, Heating, Refrigeration Institute), ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers), and SMACNA (Sheet Metal and Air Conditioning Contractors National Association).
    f. Explain the importance of local licensing codes.
    g. Explain how the codes affect the installation and operation of HVAC (Heating, Ventilation, and Air Conditioning) equipment.
    h. Explain the relationship between manufacturers' suggested installation procedures and codes.
    i. Explain the importance of codes as they pertain to safety.
    j. Compare commercial codes and codes that pertain to residential applications.
    k. Demonstrate knowledge of codes that relate to the installation of HVAC (Heating, Ventilation, and Air Conditioning) equipment.

HVAC Electricity 460817

This course introduces students to the basic physics of electricity. Students apply Ohm's Law; measure resistance, voltage, ohms, watts and amps; construct various types of electrical circuits; select wire and fuse sizes; and learn to troubleshoot an electric motor and motor controls.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. HVAC (Heating, Ventilation, and Air Conditioning) Principles, Terminology, and Safety:
    a. Define basic terminology used in the HVAC (Heating, Ventilation, and Air Conditioning) industry.
    b. Describe the various types of tools and equipment used in HVAC (Heating, Ventilation, and Air Conditioning) and their proper use.
    c. Follow approved safety procedures.
    d. Explain the procedure for lockout/tagout system.
2. Electrical:
    a. Discuss electrical safety procedures and techniques.
    b. Explain the physics of electricity and electrical circuits.
    c. Identify the various types of single phase and three phase components.
    d. Explain how to use and read various instruments needed for checking and testing electrical circuits and components.
3. HVAC (Heating, Ventilation, and Air Conditioning) Electricity:
    a. Demonstrate electrical safety.
    b. Measure ohms with an ohmmeter.
    c. Measure voltage with a voltmeter.
    d. Measure amps with an ammeter.
    e. Measure watts with a wattmeter.
    f. Solve electrical circuit problems using Ohm's Law.
    g. Draw and interpret electrical symbols.
    h. Construct series circuits.
    i. Construct parallel circuits.
    j. Connect, operate, and identify the types of single-phase motors.
    k. Measure the resistance of windings in a split-phase motor and identify the start/run windings.
    l. Test capacitors.
    m. Select wire and fuse sizes.
    n. Test transformers.
    o. Locate faults in electrical circuits.
    p. Identify types of 3-phase power supplies.
    q. Troubleshoot magnetic motor starters and coils.

Ice Machines 460845

This course introduces students to the operation, checking, adjusting, and troubleshooting of commercial ice makers. The student will learn to adjust, check, clean, and troubleshoot commercial ice machines.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Practice and observe safety procedures and techniques.
2. Explain the operation of ice making.
3. Follow manufacturers' instructions for cleaning the evaporator.
4. Clean the condenser.
5. Check the harvest cycle.
6. Adjust cube size.
7. Check for and repair leaks.
8. Inspect the electrical circuit.
9. Adjust the metering device for proper operation.
10. Measure grid heater current when applicable.
11. Clean ice storage bin.
12. Inspect and clean drains as necessary.
13. Replace bearings in flake-type machine.
14. Check and adjust the water level.
15. Check and adjust water pressure.
16. Level machine.
17. Check water pump.
18. Explain water spray system for ice making.
19. Treat water properly.

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply work site and shop safety rules, and to apply OSHA regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Introduce First Aid and CPR.
2. Apply worksite and lab safety procedures.
3. Apply personal safety rules and procedures.
4. Apply fire prevention rules and procedures.
5. Demonstrate hazardous communications procedures.
6. Describe and demonstrate universal precaution procedures.
7. Obtain 1926 Construction OSHA (Occupational Safety and Health Administration) 10 certification (recommended but not required).
8. Obtain First Aid and CPR (cardiopulmonary resuscitation) certifications if provisions allow.

Internship (Air Conditioning) 460883

Internship provides on-the-job work experience related to the student's educational objectives. Students participating in the internship do not receive compensation.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Journeyman Preparation 460846

This course includes a series of lectures, discussions, and presentations pertaining to the proper application of HVAC (Heating, Ventilation, and Air Conditioning) codes. The class will help prepare the student to pass the Kentucky Journeyman HVAC (Heating, Ventilation, and Air Conditioning) licensing exam.

Recommended Grade Level: 10 – 12

Recommended Credit: .5

Students will:

1. Explain the importance of local licensing codes.
2. Explain how the codes affect the installation and operation of HVAC (Heating, Ventilation, and Air Conditioning) equipment.
3. Explain the relationship between manufacturers' suggested installation procedures and codes.
4. Explain the importance of codes as they pertain to safety.
5. Compare commercial codes and codes that pertain to residential applications.
6. Demonstrate knowledge of codes that relate to the installation of HVAC (Heating, Ventilation, and Air Conditioning) equipment.

Refrigeration Fundamentals 460828

This course introduces the fundamentals of refrigeration, refrigeration terms, and the basic refrigeration cycle. Proper use of tools, test equipment, and materials is stressed. Environmental issues including refrigerant handling are discussed. Refrigerant piping and methods used to join them are taught. General and specific safety is emphasized.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. HVAC (Heating, Ventilation, and Air Conditioning) Principles, Terminology, and Safety:
    a. Define basic terminology used in the HVAC (Heating, Ventilation, and Air Conditioning) industry.
    b. Explain physical laws which apply to refrigeration.
    c. Explain principles of heat flow.
    d. Explain the relationship between pressure and temperature of a substance.
    e. Discuss the relationship between heat, humidity, and human comfort.
    f. Discuss EPA regulations regarding recovery, recycling, and proper handling of refrigerants.
    g. Describe the various types of tools and equipment used in HVAC (Heating, Ventilation, and Air Conditioning) and their proper use.
    h. Follow approved safety procedures.
2. HVAC (Heating, Ventilation, and Air Conditioning) Installation Requirements:
    a. Explain the relationship between mechanical codes and proper installation of HVAC (Heating, Ventilation, and Air Conditioning) equipment.
    b. Discuss installation requirements for duct systems, piping, and condensate disposal.
    c. Discuss techniques on the proper use of code books and reference manuals.
3. Plan Analysis:
    a. Identify universal symbols used in equipment manuals and building and mechanical plans
4. Refrigeration Fundamentals – The Basic Refrigeration System:
    a. Explain the history of refrigeration.
    b. Identify and explain the operation of the four major components.
    c. Identify the high and low sides of the system.
    d. Explain the four parts of the refrigeration cycle.
    e. Draw a mechanical refrigeration system diagram (Plan Analysis).
    f. Explain the benefits of superheat and subcooling.
    g. Describe heat exchange techniques.
    h. Explain saturation temperature.
    i. Identify different types of evaporators.
    j. Identify different types of compressors.
    k. Identify different types of metering devices.
    l. Identify different types of condensers.

m. Identify refrigeration system accessories.

5. Thermal Dynamics, Heat and Pressure:
    a. Define matter and heat.
    b. Distinguish between the three states of matter.
    c. Explain the direction and rate of heat flow.
    d. Describe the three methods of heat transfer.
    e. Identify the reference points of temperature: boiling point, freezing point, critical temperature, absolute zero.
    f. Explain the difference between heat and temperature.
    g. Explain the difference between latent and sensible heat.
    h. Explain the relationship of pressures and fluids at different temperatures.
    i. Calculate absolute and gauge pressures.
    j. Compare temperature with pressure (T/P chart).
    k. Explain why fluids flow.
6. Refrigerants:
    a. Define the properties of refrigerants.
    b. Explain the uses of different refrigerants.
    c. Identify color coding of refrigerant cylinders.
    d. Explain classifications of refrigerants.
    e. Transfer and store refrigerants properly.
    f. Identify the effects of improper refrigerant in a system.
7. Equipment Installation and Materials:
    a. Identify fasteners: bolts, screws, masonry anchors, various electrical connectors, conduit, pipe and cable clamps, and nails.
    b. Identify types of pipe and tubing used in refrigeration work.
    c. Identify various types of fittings.
    d. Describe methods of insulating pipe and tubing.
    e. Identify soldering and brazing alloys used in HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration).
    f. Explain applications of soldering and brazing alloys.
    g. Flare copper tubing.
    h. Swage copper tubing.
    i. Bend copper tubing.
    j. Identify types of torches.
8. Tools and Instrumentation:
    a. Measure absolute and gauge pressures.
    b. Identify basic tools and accessories: various screwdrivers, nut drivers, socket wrenches, Allen wrenches, open-end and box-end wrenches, and flare wrenches.
    c. Identify power tools: various drills, reciprocating saw, circular saw, portable band saw, and jig saw.
    d. Identify pipe and tubing tools: pipe cutters, tubing cutters, reamers, threaders, benders, flaring tools, swaging tools, and pipe vises.
    e. Describe lubrication methods utilizing grease guns, oilers, and sprays.
    f. Measure pressures with a refrigeration gauge manifold.
    g. Evacuate a system with a two-stage vacuum pump.
    h. Measure vacuums with an electronic vacuum gauge.

i. Measure temperatures with various thermometers.
j. Solder and braze copper piping/tubing.
k. Cut, ream and thread black iron pipe.

9. System Operation, Service and Maintenance:
    a. Practice and observe safety practices and techniques.
    b. Charge a system with refrigerant using an electronic charging scale.
    c. Charge a system with refrigerant on the liquid side as well as the suction side.
    d. Check for refrigerant leaks using various methods.
    e. Repair refrigerant leaks.
    f. Test and adjust all operating and safety controls.
    g. Replace liquid line filter driers.
    h. Inspect electrical circuit for defective connections and make repairs if needed.
    i. Interpret electrical wiring diagrams.
    j. Clean out condensate drain lines.
    k. Check voltage supply and amp draw of all electrical components.
    l. Clean a condenser coil (air and water).
    m. Clean an evaporator coil.
    n. Perform all aspects of preventive HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration) maintenance.

Residential Energy Auditor Prep 460804

This course will provide step by step instruction and best practices involved in performing a residential energy audit. Ethics and customer relations, energy consumption and quality control inspecting. Building shell diagnosing, shell leakage, evaluating heating systems. The course will include evaluation of base-load measures, windows, doors, and exterior insulation. Mobile homes and safety issues are also covered.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Safety and Health:
    a. Receive safety training applied to energy auditing.
    b. Discuss safety considerations for air leakage.
    c. Discuss combustion safety.
    d. Evaluate chimneys and liners and safety.
    e. Discuss and evaluate health and safety issues, pollutant sources, and CO.
    f. Inform student about lead-safe weatherization.
    g. Practice electrical safety.
2. Energy Auditor Prep:
    a. Discuss the purpose of an energy audit.
    b. Explore the energy auditing process, visual inspection, diagnostics testing, and numerical analysis.
    c. Examine differences of work inspections, in-progress inspections, final inspections, quality assurance, and energy auditing gas and ethics.
    d. Evaluate attic and roof insulation, story and a half homes, and closed-roof cavities.
    e. Evaluate walk-up stairways and doors and retractable attic stairways.
    f. Evaluate wall insulation.
3. Ethics and Consumer Relations:
    a. Practice customer relations, communication skills, customer interviews, and best sales practices.
    b. Practice customer education, reducing heating consumption, hot water and laundry, and cooling consumption.
    c. Use infrared and thermal scanning.
4. Building Shell Diagnosing and Shel Leakage:
    a. Discuss safety considerations for air leakage.
    b. Observe and learn about air leakage problems and solutions.
    c. Discuss goals of air leak testing and use of blower door.
    d. Discuss and practice air sealing approaches.
    e. Discuss crawl space moisture control.
    f. Describe heat sink methods.
    g. Evaluate moisture problems and mold.
    h. Perform evaluation of shell leakage.

5. Evaluate Heating and Air Conditioning Systems:
    a. Evaluate heating system replacement.
    b. Perform inspection of gas and oil furnaces.
    c. Discuss wood stoves safety and venting.
    d. Test draft and venting of combustion air.
    e. Practice leak testing for gas piping.
    f. Perform co carbon monoxide testing pap.
    g. Discuss ways of improving inadequate draft.
    h. Evaluate duct air distribution.
    i. Practice evaluating duct leakage.
    j. Discuss duct insulation and type.
    k. Discuss instructions and installation of programmable thermostats.
    l. Perform electric heating inspections.
    m. Perform heat pump inspections.
    n. Practice evaluating central air conditioning system.
    o. Check duct leakage and air flow.
    p. Review ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) 6.2.2-2007 ventilation standards.
    q. Evaluate whole house ventilation systems.
6. Evaluate Water Heaters:
    a. Complete water heater inspection: gas, electric, tankless, and solar.
    b. Evaluate water heater energy savings.
7. Evaluation Base-Load Measures, Windows, Doors, and Exterior Insulation:
    a. Understand energy usage, base-load usage, seasonal usage, energy index, electrical peak load, and carbon foot print.
    b. Identify thermal bonding decisions and determine floor and foundation insulation.
    c. Discuss combustion safety.
    d. Evaluate chimneys and liners and safety.
    e. Practice air conditioning equipment sizing.
    f. Discuss lighting improvements.
    g. Explore different window shading/treatments interior and exterior.
    h. Observe and discuss landscaping for shade.
    i. Discuss exterior storm windows.
    j. Evaluate window replacement and weather stripping.
    k. Evaluate moisture problems and mold.
    l. Practice evaluating belly and side wall insulation.
    m. Discuss evaluation of window and door replacements.
8. Mobile Homes:
    a. Evaluate moisture problems and mold.
    b. Discuss crawl space moisture control.
    c. Explore mobile home general auditing task.
    d. Practice evaluating mobile home insulation.
    e. Practice evaluating belly and side wall insulation.
    f. Perform evaluation of shell leakage.
    g. Discuss evaluation of window and door replacements.

Sheet Metal Fabrication 460847

The student will learn to make patterns and lay out and construct common sheet metal duct fittings.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Lay out and construct common sheet metal duct fittings.
2. Construct duct connectors of all shapes and sizes.
3. Construct duct couplings of all shapes and sizes.
4. Construct three-way and four-way duct fittings of various sizes.
5. Lay out a duct system for a residence or commercial building.
6. Install duct system in a residence or commercial building.

Special Problems (Air Conditioning) 460877

This course is designed for the student who has demonstrated specific special needs.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Complete selected tasks and problems as determined by the instructor.

Special Topics (HVAC) 460890

Instruction related to Electrical Technology but not described in the other courses.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 – 1

Students will:

1. Complete selected tasks and problems as determined by the instructor.

BUILDING AND APARTMENT MAINTENANCE PATHWAYS

Construction Track CIP 46.0000.99

The Tech-Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete four (4) credits.

A minimum of four (4) courses chosen from the partnering technical center's construction course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK website.

Residential Maintenance Carpenter Assistant CIP 46.0401.01

This pathway prepares individuals to apply technical knowledge and skills to keep a building functioning, and to service a variety of structures including commercial and industrial buildings and mobile homes. Includes instruction in the basic maintenance and repair skills required to service building systems, such as air conditioning, heating, plumbing, electrical, major appliances, and other mechanical systems.

BEST PRACTICE COURSES

Complete two (2) credits:

- 460241 Introduction to Building and Apartment Maintenance
- 460220 Residential Maintenance Carpentry

Choose two (2) credits from the following:

- 460818 Residential HVAC Maintenance
- 460222 Residential Interior Maintenance
- 460114 Residential Maintenance Masonry
- 460333 Residential Maintenance Wiring
- 460516 Residential Maintenance Plumbing
- 460229 Co-op (BAM) **OR** 460232 Internship (BAM)

BUILDING AND APARTMENT MAINTENANCE COURSES

Basic Blueprint Reading 499920

This course presents basic applied math, lines, multi-view drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, threads and fasteners, and sketching typical to all shop drawings. Safety will be emphasized as an integral part of the course.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Basic Blueprint Reading:
    a. Introduction and math review including fractions and decimals.
    b. Identify the alphabet of lines.
    c. Identify multiple views.
    d. Arrange multiple views.
    e. Arrange two-view drawings.
    f. Identify one-view drawings.
    g. Arrange and identify auxiliary views.
    h. Demonstrate the use of size and location dimensions.
    i. Demonstrate proper dimensions of cylinders and arcs.
    j. Size dimensions of holes and angles.
    k. Locate dimensions for centering of holes, points, and centers.
    l. Interpret the base line dimensions on drawings.
    m. Identify half, full, and removed sections.
    n. Identify electrical schematic and diagram symbols.
    o. Identify welding symbols and equipment.
    p. Interpret ordinate and tabular dimensions.
    q. Set tolerances using geometric dimensioning techniques.
    r. Sketch parts with irregular shapes.
    s. Sketch oblique views of various parts.
    t. Sketch and dimension shop drawings.
    u. Dimension parts using shop notes.
    v. Calculate tolerances.
    w. Identify labeling of various screw threads.
    x. Calculate tapers and machined surfaces.
    y. Interpret connections and flow of various electrical, hydraulic, and pneumatic schematics and diagrams.

Basic Troubleshooting 499925

This course explores the science of troubleshooting and the importance of proper maintenance procedures; how to work well with others, aids in communication, and trade responsibilities; examines actual troubleshooting techniques, aids in troubleshooting, and how to use schematics and symbols; focuses on specific maintenance tasks such as solving mechanical and electrical problems, breakdown maintenance, and the how and why of planned maintenance.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Basic Troubleshooting:
    a. Explain the reason efficient troubleshooting is important in a production plant.
    b. List the steps in troubleshooting a machine/system.
    c. Demonstrate good communication skills when dealing with plant personnel.
    d. List the questions that should be asked when a machine/system fails.
    e. List the signs of a machine in need of service.
    f. List the information that should be recorded in a machine equipment record.
    g. Identify calibration standards.
    h. Identify different troubleshooting test equipment.
    i. Use schematics when troubleshooting.
    j. Identify differences in schematics when troubleshooting.
    k. Use a troubleshooting chart.
    l. Identify bearing wear problems.
    m. Identify pump failure problems and solutions.
    n. Identify types of hosing.
    o. Identify current and voltage characteristics of wire.
    p. Apply all safety rules when working with electrical equipment.
    q. Identify a pictorial diagram, a blocking diagram, and a schematic diagram.
    r. Demonstrate how to troubleshoot an electrical problem.
    s. Demonstrate preventive maintenance procedures.

Co-Op (Building and Apartment Maintenance) 460229

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Electrical Components 460826

This course defines the electrical components of an air conditioning system. Different types of line voltages, wiring diagrams, and solid-state devices are included. Safety is emphasized.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Practice and observe safety procedures and techniques.
2. Measure voltage with digital and analog voltmeters.
3. Measure AC current with a clamp-on ammeter.
4. Check winding insulation with a megohmmeter.
5. Define watts, ohms, volts, and amps.
6. Define and compare single and multi-phase voltage and current.
7. Demonstrate proper use of ohmmeter, ammeter, and voltmeter (voltage, ohms, capacitance, and micro amps).
8. Calculate electrical circuit loads.
9. Use appropriate meters to check fuses and breakers.
10. Interpret tables and charts from National Electrical Code (NEC).
11. Figure wire sizes and voltage drop.
12. Draw and identify power transformer types.
13. Size and test fuses and breakers and safely replace them.
14. Use NEC tables to size conduit.
15. Define relays, sequencers, contactors, capacitors, defrost timers, crankcase heaters, water valves, damper actuators, thermostats, controllers, rheostats, zone valves, and solenoids.
16. Explain the operation and application of: split phase motors, three phase motors, variable speed motors, shaded pole motors, and permanent split capacitor motors.
17. Demonstrate proper use of testing equipment for motors.
18. Interpret detailed instructions for wiring circuits.
19. Draw electrical circuits in accordance with standard wiring procedures.
20. Wire actual electrical circuits from wiring diagrams.
21. Explain the use of various electrical components in HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration).
22. Interpret schematic wiring diagrams into a sequence of operation for HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration) equipment.
23. Rewire a HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration) unit using a schematic diagram.
24. Develop an approved routine for electrical troubleshooting.

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply work site and shop safety rules, and to apply OSHA (Occupational Safety and Health Administration) regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Introduce First Aid and CPR (cardiopulmonary resuscitation).
2. Apply worksite and lab safety procedures.
3. Apply personal safety rules and procedures.
4. Apply fire prevention rules and procedures.
5. Demonstrate hazardous communications procedures.
6. Describe and demonstrate universal precautions procedures.
7. Obtain 1926 Construction OSHA (Occupational Safety and Health Administration) 10 certification (recommended but not required).
8. Obtain First Aid and CPR (cardiopulmonary resuscitation) certifications if provisions allow.

Internship (BAM) 460232

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the internship do not receive compensation.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Introduction to Building and Apartment Maintenance 460241

This course covers required safety practices in the shop and workplace; identification and use of hand tools used in the construction trades; identification of construction materials; interpretation of blueprints and/or drawings; and exposure to various mechanical and structural systems in a residential structure.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Safety:
    a. Demonstrate knowledge of safe shop practices and procedures.
    b. Demonstrate knowledge of fire safety equipment.
    c. Demonstrate knowledge of first aid procedures.
    d. Demonstrate safety with handling and positioning of ladders.
2. Measuring Instruments:
    a. Identify and understand how to use measuring instrument tools.
3. Hand Tools:
    a. Understand how to safely use hand tools.
    b. Identify and understand how to properly use a hammer.
    c. Identify and understand how to properly use screwdrivers.
    d. Identify and understand how to properly use a sledge hammer.
    e. Identify and understand how to properly use ripping bar and nail pullers.
    f. Identify and understand how to properly use a wrench.
    g. Identify and understand how to properly use pliers and wire cutters.
    h. Identify and understand how to properly use a level.
    i. Identify and understand how to properly use a square.
    j. Identify and understand how to properly use a bench vise.
    k. Identify and understand how to properly use a clamp.
    l. Identify and understand how to properly use a hand saw.
    m. Identify and understand how to properly use a file and rasp.
    n. Identify and understand how to properly use a chisel and punch.
    o. Identify and understand how to properly use a plumb bob.
    p. Identify and understand how to properly use a socket and ratchet
    q. Identify and understand how to properly use a torque wrench.
    r. Identify and understand how to properly use a wedge.
    s. Identify and understand how to properly use a chalk line.
    t. Identify and understand how to properly use a utility knife.
    u. Identify and understand how to properly use a chain fall and come-along.
    v. Identify and understand how to properly use a wire brush.
    w. Identify and understand how to properly use a shovel.
    x. Identify and understand how to properly maintain hand tools.
4. Power Tools:
    a. Understand how to safely use power tools.

    b. Identify and understand how to properly use a power drill.
    c. Identify and understand how to properly use a circular saw.
    d. Identify and understand how to properly use a grinder and sander.
    e. Identify and understand how to properly use miscellaneous power tools.
    f. Identify and understand how to maintain power tools.
    g. Identify and understand how to use stationary tools.
5. Fastening and Anchoring Devices:
    a. Identify and understand how to use fastening devices.
    b. Identify and understand how to use anchoring devices.
6. Construction:
    a. Identify and understand basic framing components.
    b. Identify and understand basic construction materials.
    c. Identify and understand residential mechanical system.
7. Basic Blueprint:
    a. Identify blueprints and drawings.
    b. Sketch a drawing.

Introductory Masonry 460112

Introduce various types of mortar and cement along with the use of basic masonry tools. Emphasis will be on the different methods of spacing materials on a construction site, the 6-8-10 method, and use of the transit level, brick spacing, and modular rule. Instruction will focus on laying straight and plumb brick to the line, bricking gables and building columns. Permits application techniques for setting up different types of masonry materials, marking off layout lines, and erecting batter boards along with techniques employed in different types of weather and climates.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Proportion and mix mortars manually with a hoe and mortar box.
2. Set up and maintain a mortar mixer.
3. Proportion and mix mortar with electric and gasoline powered mixers.
4. Setup and maintain masonry saws.
5. Stock a mortar board or pan.
6. Temper mortar.
7. Lay out building lines using the 6-8-10 method.
8. Square corners with a framing square.
9. Determine coursing with a brick spacing rule and with a modular mason's rule.
10. Determine coursing with a modular mason's rule.
11. Drop jack lines.
12. Set corner poles for veneer.
13. Set freestanding corner poles.
14. Plumb and level with a mason's two (2) and four (4) foot levels.
15. Plumb with a plumb bob.
16. Chalk a line.
17. Set lines, pins, blocks, and twigs.
18. Inspect, assemble, and disassemble rigging and scaffolding.
19. Carry brick with tongs.
20. Cut masonry materials with hand tools.
21. Cut materials with a masonry saw.
22. Identify brick types.
23. Spread mortar for brick.
24. Make head joints for brick.
25. Lay inside and outside brick corner leads.
26. Gauge masonry walls with a mason's modular rule.
27. Dry bond brick.
28. Bond a brick wall for range with a rule.
29. Lay brick to a line while holding bond.
30. Tuck-point a wall.
31. Finish joints with a variety of tools.

32. Identify types of block.
33. Lay out block corners and walls with a tape measure.
34. Bond corners for all widths of block.
35. Spread mortar for block.
36. Lay inside and outside block corner leads.
37. Lay a block wall to a line.
38. Lay closure block/brick.
39. Lay 4” partition block walls, and cap block.
40. Install foundation vents.

Refrigeration Fundamentals 460828

This course introduces the fundamentals of refrigeration, refrigeration terms, and the basic refrigeration cycle. Proper use of tools, test equipment, and materials is stressed. Environmental issues including refrigerant handling are discussed. Refrigerant piping and methods used to join them are taught. General and specific safety is emphasized.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. The Basic Refrigeration System:
    a. Explain the history of refrigeration.
    b. Identify and explain the operation of the four major components.
    c. Identify the high and low sides of the system.
    d. Explain the four parts of the refrigeration cycle.
    e. Draw a mechanical refrigeration system diagram.
    f. Explain the benefits of superheat and sub cooling.
    g. Describe heat sink methods.
    h. Describe heat exchange techniques.
    i. Explain saturation temperature.
    j. Identify different types of evaporators.
    k. Identify different types of compressors.
    l. Identify different types of metering devices.
    m. Identify different types of condensers.
    n. Identify refrigeration system accessories.
2. Thermal Dynamics, Heat and Pressure:
    a. Define matter and heat.
    b. Distinguish between the three states of matter.
    c. Explain the direction and rate of heat flow.
    d. Describe the three methods of heat transfer.
    e. Identify the reference points of temperature: boiling point, freezing point, critical temperature, absolute zero.
    f. Explain the difference between heat and temperature.
    g. Explain the difference between latent and sensible heat.
    h. Explain the relationship of pressures and fluids at different temperatures.
    i. Calculate absolute and gauge pressures.
    j. Compare temperature with pressure (T/P chart).
    k. Explain why fluids flow.
3. Refrigerants:
    a. Define the properties of refrigerants.
    b. Explain the uses of different refrigerants.
    c. Identify color coding of refrigerant cylinders.
    d. Explain classifications of refrigerants.
    e. Demonstrate proper transfer and storage of refrigerants.

    f. Identify the effects of improper refrigerant in a system.
4. Equipment Installation and Materials:
    a. Identify fasteners: bolts, screws, masonry anchors, various electrical connectors, conduit, pipe and cable clamps, and nails.
    b. Identify types of pipe and tubing used in refrigeration work.
    c. Identify various types of fittings.
    d. Describe methods of insulating pipe and tubing.
    e. Identify soldering and brazing alloys used in HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration).
    f. Explain applications of soldering and brazing alloys.
    g. Flare copper tubing.
    h. Swage copper tubing.
    i. Bend copper tubing.
    j. Identify types of torches.
5. Tools and Instrumentation:
    a. Measure absolute and gauge pressures.
    b. Identify basic tools and accessories: various screwdrivers, nut drivers, socket wrenches, Allen wrenches, open-end and box-end wrenches, and flare wrenches.
    c. Identify power tools: various drills, reciprocating saw, circular saw, portable band saw, and jig saw.
    d. Identify pipe and tubing tools: pipe cutters, tubing cutters, reamers, threaders, benders, flaring tools, swaging tools, and pipe vises.
    e. Measure pressures with a refrigeration gauge manifold.
    f. Evacuate a system with a two-stage vacuum pump.
    g. Measure vacuums with an electronic vacuum gauge.
    h. Measure temperatures with various thermometers.
    i. Solder and braze copper piping/tubing.
    j. Cut, ream, and thread black iron pipe.
6. System Operation, Service and Maintenance:
    a. Practice and observe safety practices and techniques.
    b. Change a system with refrigerant using an electronic charging scale.
    c. Charge a system with refrigerant on the liquid side as well as the suction side.
    d. Check for refrigerant leaks using various methods.
    e. Repair refrigerant leaks.
    f. Test and adjust all operating and safety controls.
    g. Replace liquid line filter driers.
    h. Inspect electrical circuit for defective connections and make repairs if needed.
    i. Interpret electrical wiring diagrams.
    j. Clean out condensate drain lines.
    k. Check voltage supply and amp draw of all electrical components.
    l. Clean a condenser coil (air and water).
    m. Clean an evaporator coil.
    n. Perform all aspects of preventive HVACR (Heating, Ventilation, Air Conditioning, and Refrigeration) maintenance.

Residential Energy Auditor Prep 460804

This course will provide step by step instruction and best practices involved in performing a residential energy audit. Ethics and customer relations, energy consumption and quality control inspecting. Building shell diagnosing, shell leakage, evaluating heating systems. Evaluation base load measures, windows, doors, and exterior insulation evaluations. Mobile homes and health and safety issues are also covered.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Safety and Health:
    a. Students will receive safety training applied to energy auditing.
    b. Discuss safety considerations for air leakage.
    c. Discuss combustion safety.
    d. Evaluate chimneys and liners and safety.
    e. Discuss and evaluate health and safety issues pollutant sources and CO.
    f. Inform students about lead – safe weatherization.
    g. Practice electrical safety.
2. Energy Auditor Prep:
    a. Discuss the purpose of an energy audit.
    b. Explore the energy auditing process, visual inspection, diagnostics testing, and numerical analysis.
    c. Examine differences of work inspections, in progress inspections, final inspections, quality assurance, energy auditing gas, and ethics.
    d. Students will practice evaluating attic and roof insulation/story and a half homes and closed roof cavities.
    e. Students will practice evaluating walk-up stairways and doors/retractable attic stairways.
    f. Students will perform evaluation of wall insulation.
3. Ethics and Consumer Relations:
    a. Students will practice customer relations, communication skills, customer relations, and best sales practices.
    b. Students will practice customer education relating to reducing heating consumption, hot water and laundry, and cooling consumption.
    c. Students will receive instruction on using infrared and thermal scanning
4. Building Shell Diagnosing and Shell Leakage:
    a. Discuss safety considerations for air leakage.
    b. Students will observe and learn about air leakage problems and solutions.
    c. Discuss goals of air leak testing/use of blower door.
    d. Discuss and practice air sealing approaches.
    e. Discuss crawl space moisture control.
    f. Evaluate moisture problems and mold.
    g. Perform evaluation of shell leakage.

5. Evaluate Heating and Air Conditioning Systems:
    a. Evaluate heating system replacement.
    b. Perform inspection of gas and oil furnaces.
    c. Discuss wood stoves safety and venting.
    d. Test draft and venting of combustion air.
    e. Practice leak testing gas piping.
    f. Perform co carbon monoxide testing pap.
    g. Discuss ways of improving inadequate draft.
    h. Evaluate duct air distribution.
    i. Practice evaluating duct leakage.
    j. Discuss duct insulation and type.
    k. Discuss instructions and installation of programmable thermostats.
    l. Perform electric heating inspections.
    m. Perform heat pump inspections.
    n. Practice evaluating central air conditioning system.
    o. Check duct leakage and air flow.
    p. Review ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) 6.2.2-2007 ventilation standards.
    q. Evaluate whole house ventilation systems.
6. Evaluate Water Heaters:
    a. Complete water heater inspection for gas, electric, tankless, and solar
    b. Evaluate water heater energy savings.
7. Evaluation Base Load Measures, Windows, Doors, and Exterior Insulation:
    a. Students will be instructed on understanding energy usage, base load usage, seasonal usage, energy index, electrical peak load, and carbon footprint.
    b. Student will identify thermal bonding decisions and determine floor and foundation insulation.
    c. Discuss combustion safety.
    d. Evaluate chimneys and liners and safety.
    e. Practice air conditioning equipment sizing.
    f. Discuss lighting improvements.
    g. Explore different window shading and treatments interior and exterior.
    h. Observe and discuss landscaping for shade.
    i. Discuss exterior storm windows.
    j. Evaluate window replacement and weather stripping.
    k. Evaluate moisture problems and mold.
    l. Practice evaluating belly and side wall insulation.
    m. Discuss evaluation of windows and doors/replacement.
8. Mobile Homes:
    a. Evaluate moisture problems and mold.
    b. Discuss crawl space moisture control.
    c. Explore mobile home general auditing task.
    d. Practice evaluating mobile home insulation.
    e. Practice evaluating belly and side wall insulation.
    f. Perform evaluation of shell leakage.
    g. Discuss evaluation of windows and doors/replacement.

Residential HVAC Maintenance 460818

This course covers the basic aspects of maintaining various heating, ventilating, and air conditioning systems in residential buildings.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Use safe HVAC (Heating, Ventilation, and Air Conditioning) procedures.
2. Explain the basic operation of furnaces.
3. Inspect a ventilation system.
4. Light and adjust a pilot light.
5. Adjust burners.
6. Inspect heat exchangers.
7. Adjust belts and pulleys.
8. Service fan motors.
9. Check air circulation around units.
10. Replace air filters.
11. Clean condensing and/or cooling coils.
12. Inspect flues.
13. Install thermostats.
14. Inspect and clean condensate lines.
15. Replace a thermocouple.
16. Install window air conditioning units.

Residential Interior Maintenance 460222

This course covers the basic aspects of drywall hanging, finishing, and repair; painting; window, door, and floor moldings; laying composition and vinyl flooring; and maintaining ceramic tile.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Safely perform drywall practices.
2. Use drywall hammers, knives, saws, and sanders.
3. Measure, cut, and hang drywall.
4. Repair/replace cornerbead.
5. Mix and prepare joint compound.
6. Finish drywall joints.
7. Mix texturing compound.
8. Apply texture to ceilings.
9. Repair/replace damaged drywall.
10. Clean and maintain drywall tools.
11. Estimate drywall materials.
12. Practice painting safety.
13. Select and use a variety of paints.
14. Prepare an area for painting.
15. Prepare surfaces for painting.
16. Caulk cracks and moldings.
17. Cut-in corners and trim with brushes.
18. Apply coatings with rollers and brushes.
19. Clean and maintain painting tools.
20. Estimate materials for painting.
21. Repair damaged wallpaper.
22. Use floor covering tools.
23. Install underlayment.
24. Repair/replace composition floor tiles.
25. Repair/replace vinyl flooring.
26. Estimate materials for floor coverings.
27. Re-grout and caulk ceramic tiles.

Residential Maintenance Carpentry 460220

This course covers the basic aspects of framing, roofing, window, door, and stair maintenance. The student will receive training in the proper use of ladders and in the handling and storage of building materials.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate safe carpentry practices.
2. Construct and/or install a partition wall.
3. Frame wall openings.
4. Install/repair roof flashing.
5. Install rolled roofing.
6. Install/replace composition shingles.
7. Weatherproof exterior siding.
8. Install/repair doors.
9. Install/repair door hardware.
10. Install/repair windows.
11. Construct concrete forms.
12. Install insulation.
13. Maintain gutters and downspouts.
14. Re-glaze a window sash.
15. Install/repair a window screen.
16. Knowledge of building and trade codes.
17. Safely and properly handle and store materials.
18. Calculate material costs.
19. Knowledge of ordering and reviewing materials.

Residential Maintenance Masonry 460114

This course covers the basic aspects of masonry as it relates to the residential structure. Emphasis is placed on proper handling, mixing, placing, and finishing of Portland cement products.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Practice safe masonry procedures.
2. Use masonry trowels, hammers, and chisels.
3. Proportion and mix concrete.
4. Install concrete.
5. Edge, joint, and finish concrete.
6. Measure and mix mortar with a hoe and mortar box.
7. Repair/replace bricks.
8. Repair/replace concrete blocks.
9. Tuck-point walls.
10. Cut masonry materials with hand tools.
11. Cut masonry materials with a circular saw.
12. Clean and maintain masonry tools.
13. Estimate masonry materials.
14. Store masonry tools, materials, and equipment.

Residential Maintenance Plumbing 460516

This course covers the basic aspects of clearing blocked drains, repairing leaks, repair and replacement of residential plumbing fixtures, and working with copper, plastic, and steel pipes.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Practice safe plumbing procedures.
2. Identify plumbing systems components.
3. Use plumber's cutting, cleaning, and joining tools.
4. Remove obstructions from building drains.
5. Repair malfunctioning valves and faucets.
6. Measure, cut, ream, and join copper pipe.
7. Cut and join plastic pipe.
8. Bend copper pipe using spring benders.
9. Join steel pipe.
10. Join pipes of different types.
11. Secure pipes.
12. Repair and replace the water supply line for a plumbing fixture.
13. Repair leaks in pipes.
14. Insulate water pipes.
15. Repair and replace waters closets.
16. Repair and replace lavatories.
17. Repair and replace kitchen sinks.
18. Test gas piping for leaks.
19. Maintain plumbing tools.
20. Estimate plumbing materials and supplies.

Residential Maintenance Wiring 460333

This course covers the basic aspects of electric theory, wire and cables, fixtures and devices, and troubleshooting and maintenance wiring;

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Practice safe electrical procedures.
2. Use electrician's cutting, stripping, and connecting tools.
3. Demonstrate knowledge of electrical theory.
4. Use electrical test equipment.
5. Route, pull, and secure cables.
6. Remove cable sheathing.
7. Make electrical connections.
8. Remove and replace device boxes.
9. Remove and replace circuit breakers and fuses.
10. Identify and mark circuits in a service panel.
11. Check overloaded circuits.
12. Remove and replace lighting fixtures.
13. Remove and replace receptacles.
14. Remove and replace various types of switches.
15. Troubleshoot and repair lighting and receptacle circuits.
16. Repair doorbell/chime system.
17. Remove and replace photo electric control.
18. Remove and replace phone outlets.
19. Maintain electrical tools.
20. Estimate electrical materials.

Sheet Metal Fabrication 460847

The student will learn to make patterns and lay out and construct common sheet metal duct fittings.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Lay out and construct common sheet metal duct fittings.
2. Construct duct connectors of all shapes and sizes.
3. Construct duct couplings of all shapes and sizes.
4. Construct three-way and four-way duct fittings of various sizes.
5. Lay out a duct system for a residential or commercial building.
6. Install duct system in a residential or commercial building.

CONSTRUCTION CARPENTRY TECHNOLOGY PATHWAYS

Construction Architectural Engineering CIP 15.101.02

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. This pathway prepares individuals to apply engineering principles and technical skills in support of architects, engineers and planners engaged in designing and developing buildings, urban complexes, and related systems. Includes instruction in design testing procedures, building site analysis, model building and computer graphics, structural systems testing, analysis of prototype mechanical and interior systems, report preparation, basic construction and structural design, architectural rendering, computer-aided drafting (CAD), layout and designs, architectural blueprint interpretation, building materials, and basic structural wiring diagramming.

BEST PRACTICE COURSES

Complete (2) two credits.

- 210221 Fundamentals of Engineering Design
- 210223 Fundamentals of Architectural and Civil Engineering

Complete (3) three credits.

- 460201 Introduction to Construction Technology
- 460213 Ceiling and Roof Framing
- 460212 Floor and Wall Framing

Construction Track CIP 46.0000.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK website.

BEST PRACTICE COURSES

Complete (4) four credits.

A minimum of four (4) courses chosen from the partnering technical center's construction course offerings. The courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

Residential Carpenter Assistant CIP 46.0201.02

This pathway prepares individuals to apply technical knowledge and skills to layout, cut, fabricate, erect, install, and repair wooden structures and fixtures, using hand and power tools. The pathway includes instruction in technical mathematics, framing, construction materials and selection, job estimating, blueprint reading, foundations and roughing-in, finish carpentry techniques, and applicable codes and standards.

BEST PRACTICE COURSES

Complete (4) four credits.

- 460201 Introduction to Construction Technology
- 460212 Floor and Wall Framing
- 460213 Ceiling and Roof Framing
- 460219 Exterior and Interior Finish

Skilled Trades Commercial Carpentry Track CIP 46.0201.99

The Commercial Skilled Trades TRACK is designed as a pre-apprenticeship pathway for students to have the opportunity to enter a Registered Apprenticeship training program upon graduation. This Skilled Trades TRACK does not require an employer partner. Students must successfully complete the four course sequence, eight safety modules and an end of program assessment. Upon conclusion, the instructor will fill out a completion form and submit to OCTE. After being processed, the student will receive a pre-apprenticeship industry certification issued by the Kentucky Labor Cabinet. This certification will be recognized by participating partners for an interview and possible credit upon placement. Credit is at the discretion of the training organization.

For more information or a list of participating organizations, please visit the Carpentry Track website.

BEST PRACTICE COURSES

Complete (4) four credits.

- 460201 Introduction to Construction Technology
- 460212 Floor and Wall Framing
- 460213 Ceiling and Roof Framing
- 460214 Site Layout and Foundations

Structural Engineering CIP 14.0803.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. This pathway prepares individuals to apply engineering principles and technical skills in support of architects, engineers and planners engaged in designing and developing buildings, urban complexes, and related systems. It includes instruction in design testing procedures, building site analysis, model building and computer graphics, structural systems testing, analysis of prototype mechanical and interior systems, report preparation, basic construction and structural design, architectural rendering, architectural-aided drafting (CAD), layout and designs, architectural blueprint interpretation, building materials, and basic structural wiring diagramming.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210223 Civil Engineering
- 210141 Building Construction Technologies

Complete (3) three credits:

- 460201 Introduction to Construction Technology
- 460218 Construction Forms
- 460214 Site Layout and Foundations

CONSTRUCTION CARPENTRY TECHNOLOGY COURSES

Cabinet Construction and Installation 460209

Students will layout and plan the construction of base and wall cabinets. They will prepare wood surfaces for finishing as well as install cabinets and special units.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Math for the Trades:
    a. Add, subtract, multiply, and divide single-, double-, and triple-digit numbers.
    b. Use mixed fractions to add, subtract, multiply, and divide parts of numbers.
    c. Convert fractions to decimals and decimals to fractions, and use decimals to find percentages.
    d. Use and understand how to read measuring tools.
    e. Construct layouts using lines, circles, and angles.
    f. Explain square roots, square numbers, and the Pythagorean Theorem.
    g. Use area measure to find the area of: rectangles, squares, and circles.
    h. Use volume measure to calculate the volume of three-dimensional objects.
2. Health and Safety:
    a. Assume responsibility for safety of self and others.
    b. Identify personal protection equipment of the trade such as eye protection, harnesses, and footwear.
    c. Identify safety standards and procedures based on "OSHA 1926 Standards".
    d. Manage personal health and wellness including substance abuse, air pollutants, chemicals, and workplace toxins.
3. Cabinet Construction and Installation:
    a. Study design layout of the different types of kitchen layouts.
    b. Identify standardized cabinet and appliance dimensions.
    c. Produce a kitchen cabinet layout.
    d. Identify components of the factory built cabinets.
    e. Lay out custom built cabinets.
    f. Construct cabinet frames.
    g. Construct cabinet boxes.
    h. Construct and install drawers.
    i. Construct and install cabinet doors.
    j. Sand, prepare, and finish wood surfaces.
    k. Install shelf supporting devices.
    l. Install cabinets.
    m. Install plastic laminates.
    n. Install counter tops.

o. Install cabinet hardware.
p. Construct and install special units such as bookcases, medicine cabinets and window seats.

Ceiling and Roof Framing 460213

This course covers roof types and combinations of roof types used in the construction industry. The emphasis of this course is on layout. Cutting and installing ceiling joists, rafters, roof sheathing, and roof coverings for both commercial and residential construction.

Content in the course should be aligned with the pathway being offered--Commercial and/or Residential

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Math for the Trades: Commercial and Residential
    a. Add, subtract, multiply, and divide single-, double-, and triple-digit numbers.
    b. Use mixed fractions to add, subtract, multiply, and divide parts of numbers.
    c. Convert fractions to decimals and decimals to fractions, and use decimals to find percentages.
    d. Use and understand how to read measuring tools.
    e. Construct layouts using lines, circles, and angles.
    f. Explain square roots, square roots, square numbers, and the Pythagorean Theorem.
    g. Use area measure to find the area of: rectangles, squares, and circles.
    h. Use volume measure to calculate the volume of three-dimensional objects.
2. Health and Safety: Commercial and Residential
    a. Assume responsibility for safety of self and others.
    b. Identify personal protection equipment of the trade such as eye protection, harnesses, and footwear.
    c. Identify safety standards and procedures based on “OSHA 1926 Standards”.
    d. Manage personal health and wellness including substance abuse, air pollutants, chemicals, and workplace toxins.
3. Wood and Metal Framing: Commercial
    a. Understand the applications of wood and metal framing including workability, varied sizes and shapes, ease of operation, fire resistance, and sound transmission.
    b. Identify the tools and fasteners used in ceiling and roof framing including fasteners, hand tools, and power tools.
    c. Identify wood and metal framing components, their sizes, gauges of metal, and types used for ceiling and roof framing.
    d. Read construction drawings and specifications including architectural, structural, mechanical, electrical, and plumbing to determine the type, location, and layout of various roof framing components.
    e. Identify different roofing systems and their associated materials.
    f. Estimate the amount of materials to complete a specified steel framing roof project.
    g. Calculate, layout, cut, and erect ceiling joists and rafters.

h. Frame roof openings and install roof sheathing.
i. Install drip edge, flashing, and roof ventilation.
j. Explain the purpose of underlayment and waterproof membrane.
k. Discuss and demonstrate how to properly prepare a roof deck for various types of roofing materials.
l. Identify, estimate, and describe installation of various roof coverings including composition shingles, metal roofing, single ply membrane, built up, and tile or slate.
m. Identify, estimate, and describe installation of ceiling, suspended ceiling, drywall, and drywall finishing.
n. Review the different types of low-slope and steep-slope roof systems available.
o. Identify the basic components of vertical and horizontal flashing systems and accessories for low- and steep-slope flashing systems.
p. Describe the estimating procedures for low-slope and steep-slope roofing projects.

4. Hand and Power Tools: Commercial and Residential
    a. Identify and demonstrate the safe and proper use of hand tools including fastening devices, leveling devices, and edge cutting devices.
    b. Identify and demonstrate the safe and proper use of power tools including electric portable, cordless, stationary, powder-actuated, and pneumatic.
5. Wood Framing: Residential
    a. Identify and construct basic roof types such as gable, gambrel, shed, and hip.
    b. Calculate, layout, cut, and erect rafters and ceiling joists to basic roof types such as gable, gambrel, shed, and hip.
    c. Frame roof openings and roof saddles.
    d. Identify the installation practices and prefabricated trusses.
    e. Cut, construct, and install trusses.
    f. Frame dormers.
    g. Install roof sheathing.
    h. Identify and install various roof coverings such as 3-tab, architectural/dimensional, metal, wood shakes, tile, and roll.
    i. Install roof underlayment.
    j. Install roof flashing and drip edge.
    k. Install various types of attic vents.

Construction Forms 460218

This course will introduce the student to heavy and commercial construction. The student will receive information about rigging, wall forms, vertical piers and columns, grade curb forms, horizontal beam forms, above-grade slab systems, fireproof encasement forms, stair forms, bridge deck forms.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Math for the Trades:
    a. Add, subtract, multiply, and divide single-, double-, and triple- digit numbers.
    b. Use mixed fractions to add, subtract, multiply, and divide parts of numbers.
    c. Convert fractions to decimals and decimals to fractions, and use decimals to find percentages.
    d. Use and understand how to read measuring tools.
    e. Construct layouts using lines, circles, and angles.
    f. Explain square roots, square numbers, and the Pythagorean Theorem.
    g. Use area measure to find the area of rectangles, squares, and circles.
    h. Use volume measure to calculate the volume of three-dimensional objects.
2. Health and Safety:
    a. Assume responsibility for safety of self and others.
    b. Identify personal protection equipment of the trade such as eye protection, harnesses, and footwear.
    c. Identify safety standards and procedures based on “OSHA 1926 Standards”.
    d. Manage personal health and wellness including substance abuse, air pollutants, chemicals, and workplace toxins.
3. Construction Forms:
    a. Discuss basic properties of concrete.
    b. Identify different soil conditions and the effects on footing design.
    c. Identify important structural components that can be fabricated from formwork and concrete.
    d. Describe and/or build various types of foundation systems.
    e. Identify form systems and components used to construct wall forms.
    f. Identify form systems and components used to construct vertical piers and columns.
    g. Describe the construction of horizontal beam forms.
    h. Explain the construction of above grade forms such as piles, piers, columns, caps, and forming.
    i. Describe the construction of fire-proofing encasement forms.
    j. Layout and estimate materials for concrete stair forms.
    k. Calculate the quantity of concrete blocks and common face brick needed for a concrete block wall.
    l. Calculate the amount of concrete needed for footings and foundation walls.

Construction Prints 460217

This course will provide a series of lectures, demonstrations, and practice exercises in the study of symbols, views, sections, details, and material lists found on architectural working drawings, building materials and specifications lists, and construction dimensioning systems and charts/schedules.

Recommended Grade Level: 10 – 12

Recommended Credit: .5

Students will:

1. Math for the Trades:
    a. Add, subtract, multiply, and divide single-, double-, and triple-digit numbers.
    b. Use mixed fractions to add, subtract, multiply, and divide parts of numbers.
    c. Convert fractions to decimals and decimals to fractions, and use decimals to find percentages.
    d. Use and understand how to read measuring tools.
    e. Construct layouts using lines, circles, and angles.
    f. Explain square roots, square numbers, and the Pythagorean Theorem.
    g. Use area measure to find the area of: rectangles, squares, and circles.
    h. Use volume measure to calculate the volume of three-dimensional objects.
2. Health and Safety:
    a. Assume responsibility for safety of self and others.
    b. Identify personal protection equipment of the trade such as eye protection, harnesses, and footwear.
    c. Identify safety standards and procedures based on "OSHA 1926 Standards".
    d. Manage personal health and wellness including substance abuse, air pollutants, chemicals, and workplace toxins.
3. Construction Prints:
    a. Demonstrate view projection techniques as applicable to the construction trades.
    b. Identify different architectural line types.
    c. Identify standard listings on construction working drawings and details.
    d. Interpret a list of architectural terms associated with planning including various symbols and uses.
    e. Identify procedural construction requirements from notations on working drawings, details and specifications.
    f. Specify duty-specific uses of contour and grade notes.
    g. Determine overall measurement such as lengths, heights, and depths.
    h. Describe various materials' usage in sectioned drawings.
    i. Describe assembly techniques used in various sectioned drawings.
    j. Complete various sectioned views.
    k. Identify various prefabricated materials from vendor catalogs.
    l. Display an understanding of estimating procedures.
    m. Construct a materials control chart for a construction project.
    n. Display an understanding of door and window schedules.

   o. Determine structural calculations.
   p. Identify plumbing, air conditioning, electrical, concrete construction, and building procedures and techniques from various related details and drawings.
   q. Compile a duty-specific hardware list for a construction project.
   r. Demonstrate duty-specific fire prevention techniques.
   s. Identify and list duty-specific problems in a multi-story dwelling.
   t. Identify all construction documents required in the completed building process.
4. Metal Framing:
   a. Read prints and specifications to determine the type of partition and its location, layout, and related requirements.
5. Building Layout:
   a. Identify and read relevant sections of the building plan.

Co-Op (Carpentry) 460242

Co-op provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Co-op Education program receive compensation for their work.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom/lab studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance educational expenses.

Exterior and Interior Finish 460219

This course presents basic concepts of building trim, gypsum wallboard, paneling, base, ceiling and wall molding with instruction on acoustical ceilings and insulation, wood floors, tile, inlaid adhesive and tools of the flooring trade. This course will continue to refine the techniques and skills taught in the previous carpentry courses. In this course, cost control, speed, and precision are emphasized. In addition, students will demonstrate the skills associated with the exterior finishing of a house.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Math for the Trades: Residential
    a. Add, subtract, multiply, and divide single-, double-, and triple-digit numbers.
    b. Use mixed fractions to add, subtract, multiply, and divide parts of numbers.
    c. Convert fractions to decimals and decimals to fractions, and use decimals to find percentages.
    d. Use and understand how to read measuring tools.
    e. Construct layouts using lines, circles, and angles.
    f. Explain square roots, square numbers, and the Pythagorean Theorem.
    g. Use area measure to find the area of: rectangles, squares, and circles.
    h. Use volume measure to calculate the volume of three-dimensional objects.
2. Health and Safety: Residential
    a. Assume responsibility for safety of self and others.
    b. Identify personal protection equipment of the trade such as eye protection, harnesses, and footwear.
    c. Identify safety standards and procedures based on “OSHA 1926 Standards”.
    d. Manage personal health and wellness including substance abuse, air pollutants, chemicals, and workplace toxins.
3. Hand and Power Tools: Residential
    a. Identify and demonstrate the safe and proper use of hand tools including fastening devices, leveling devices, and edge cutting devices.
    b. Identify and demonstrate the safe and proper use of power tools including electric portable, cordless, stationary, powder-actuated, and pneumatic.
4. Exterior and Interior Finish: Residential
    a. Install windows, interior/exterior doors, hardware and trim.
    b. Estimate material quantities, install, and finish various types of drywall.
    c. Demonstrate safe and proper use of elevated surfaces such as scaffolding and ladders.
    d. Estimate material quantities, cut and install floor, wall, and ceiling molding.
    e. Build and install cornices using different types of materials.
    f. Install soffit, gable, and ridge vents.
    g. Install various types of floor covering (optional task).
    h. Layout and construct cabinets (optional task).

i. Layout and install cabinets (optional task).

Floor and Wall Framing 460212

The student will practice floor framing, layout, and construction of floor frames. Cutting and installing floor and wall framing members according to plans and specifications will also be practiced.

Content in the course should be aligned with the pathway being offered: Commercial and/or Residential.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Math for the Trades: Commercial and Residential
    a. Add, subtract, multiply, and divide single-, double-, and triple-digit numbers.
    b. Use mixed fractions to add, subtract, multiply, and divide parts of numbers.
    c. Convert fractions to decimals and decimals to fractions, and use decimals to find percentages.
    d. Use and understand how to read measuring tools.
    e. Construct layouts using lines, circles, and angles.
    f. Explain square roots, square numbers, and the Pythagorean Theorem.
    g. Use area measure to find the area of: rectangles, squares, and circles.
    h. Use volume measure to calculate the volume of three-dimensional objects.
2. Health and Safety: Commercial and Residential
    a. Assume responsibility for safety of self and others.
    b. Identify personal protection equipment of the trade such as eye protection, harnesses, and footwear.
    c. Identify safety standards and procedures based on "OSHA 1926 Standards".
    d. Manage personal health and wellness including substance abuse, air pollutants, chemicals, and workplace toxins.
3. Hand and Power Tools: Commercial and Residential
    a. Identify and demonstrate the safe and proper use of hand tools including fastening devices, leveling devices, and edge cutting devices.
    b. Identify and demonstrate the safe and proper use of power tools including electric portable, cordless, stationary, powder-actuated, and pneumatic.
4. Wood and Metal Framing: Commercial
    a. Understand the applications of wood and metal framing including workability, varied sizes and shapes, ease of operation, fire resistance, and sound transmission.
    b. Identify wood and metal framing components and their sizes: gauges of metal; types and shapes of beams, columns, and pilasters; and various trims and fasteners used for interior partition work.
    c. Read prints and specifications to determine the type of partition and its location, layout, and related requirements.

   d. Identify, estimate, and describe installation of floor, ceiling, and wall covering including suspended ceiling, drywall, drywall finishing, door and door hardware, paneling, and trim.
5. Wood Framing: Residential
   a. Read prints and specifications to determine the type of partition and its location, layout, and related requirements.
   b. Utilize techniques for installing and squaring sill plate.
   c. Demonstrate applications of wood and metal framing including workability, varied sizes and shapes, ease of operation, fire resistance, and sound transmission.
   d. Identify wood and metal framing components and code requirements such as gauges of metal, types and shapes of beams, columns, pilasters, various trims, and fasteners used for interior partition work.
   e. Identify, estimate material and describe installation of floor, ceiling, and wall covering including suspended ceiling, drywall, drywall finishing, door and door hardware, trim, and paneling.
   f. Identify and install basic stair systems per code requirement.
6. Energy Efficiency Codes: Residential
   a. Demonstrate awareness of International Energy Conservation Code (IECC).
   b. Demonstrate awareness of installation requirements for various types of insulation.
   c. Recognize construction practices that allow the full depth/thickness of the insulation without compression including insulated headers, open corners, and open tees.

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply work site and shop safety rules, and to apply OSHA regulations. Students are encouraged to obtain certification in first aid and cardiopulmonary resuscitation.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Introduce First Aid and CPR.
2. Apply worksite and lab safety procedures.
3. Apply personal safety rules and procedures.
4. Apply fire prevention rules and procedures.
5. Demonstrate hazardous communications procedures.
6. Describe and demonstrate universal precaution procedures.
7. Obtain 1926 Construction OSHA 10 certification (recommended but not required).
8. Obtain first aid and CPR certifications if provisions allow.

Introduction to Construction Technology 460201

This course is the introduction to the construction carpentry industry. The class will emphasize safe and proper methods of operating hand tools, portable power tools, and stationary power tools in the construction industry.

Content in the course should be aligned with the pathway being offered: Commercial and/or Residential

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Math for the Trades: Commercial and Residential
    a. Add, subtract, multiply, and divide single-, double-, and triple-digit numbers.
    b. Use mixed fractions to add, subtract, multiply, and divide parts of numbers.
    c. Convert fractions to decimals and decimals to fractions, and use decimals to find percentages.
    d. Use and understand how to read measuring tools.
    e. Construct layouts using lines, circles, and angles.
    f. Explain square roots, square numbers, and the Pythagorean Theorem.
    g. Use area measure to find the area of: rectangles, squares, and circles.
    h. Use volume measure to calculate the volume of three-dimensional objects.
2. Health and Safety: Commercial and Residential
    a. Assume responsibility for safety of self and others.
    b. Identify personal protection equipment of the trade such as eye protection, harnesses, and footwear.
    c. Identify safety standards and procedures based on "OSHA 1926 Standards".
    d. Manage personal health and wellness including substance abuse, air pollutants, chemicals, and workplace toxins.
3. Hand and Power Tools: Commercial and Residential
    a. Identify and demonstrate the safe and proper use of hand tools including fastening devices, leveling devices, and edge cutting devices.
    b. Identify and demonstrate the safe and proper use of power tools including electric portable, cordless, stationary, powder-actuated, and pneumatic.
4. Building Materials, Fasteners, and Adhesives: Residential
    a. Identify use and application of building materials in construction work including lumber, sheet materials, engineered wood products, structural concrete, and structural steel.
    b. Identify use and application of fasteners and adhesives used in construction work.
5. Orientation to the Construction Trade: Residential
    a. Recognize the order of operation and responsibilities of construction trade professionals such as foreman, general contractor, and laborer.

Internship (Carpentry) 460245

Internship includes various Construction Carpentry Technology topics, issues, and trends. Topics may vary semester to semester at the discretion of the instructor; course; may be repeated with different topics to a maximum of six (6) credit hours.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom/lab studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Demonstrate a working knowledge of the topic chosen for the class.

Site Layout and Foundations 460214

Students will prepare materials, calculate the cost for a building site, and layout a site with a transit, locating property lines and corners. Students calculate the amount of concrete needed for footing and foundation walls and construct different types of foundations and forms.

Content in the course should be aligned with the pathway being offered: Commercial and/or Residential

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Math for the Trades: Commercial
    a. Add, subtract, multiply, and divide single-, double-, and triple-digit numbers.
    b. Use mixed fractions to add, subtract, multiply, and divide parts of numbers.
    c. Convert fractions to decimals and decimals to fractions, and use decimals to find percentages.
    d. Use and understand how to read measuring tools.
    e. Construct layouts using lines, circles, and angles.
    f. Explain square roots, square numbers, and the Pythagorean Theorem.
    g. Use area measure to find the area of: rectangles, squares, and circles.
    h. Use volume measure to calculate the volume of three-dimensional objects.
2. Health and Safety: Commercial
    a. Assume responsibility for safety of self and others.
    b. Identify personal protection equipment of the trade such as eye protection, harnesses, and footwear.
    c. Identify safety standards and procedures based on “OSHA 1926 Standards”.
    d. Manage personal health and wellness including substance abuse, air pollutants, chemicals, and workplace toxins.
3. Building Layout: Commercial
    a. Demonstrate an understanding of the building layout process, including safety procedures, tools, materials, survey equipment points of beginning, and benchmark.
    b. Identify and read relevant sections of the building plan.
    c. Identify tools and materials required in the building layout process.
4. Formwork/Foundations: Commercial
    a. Explain the properties of concrete and the purpose and specifications of formwork/foundations.
    b. Identify types and components of forms including footers, wall forms, bridge forms, and slab.
    c. Identify basic measures and materials used in formwork such as form material, concrete, concrete block, and reinforcement.
    d. Identify important structural components that can be fabricated from formwork/foundation and concrete including piers, columns, and pile caps.

Special Topics (Construction Carpentry) 460298

This course provides instruction related to Carpentry Technology but not described in the other courses.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Selected tasks and problems as determined by the instructor and approved by Program Consultant.

ELECTRICAL TECHNOLOGY CAREER PATHWAYS

Construction Track CIP 46.0000.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally, recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

The specifics of the TRACK Program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK website.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from the partnering technical center's construction course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

Electrical Construction Engineering CIP 15.0303.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. This pathway prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair electric apparatus and systems such as residential, commercial, and industrial electric-power wiring; and DC and AC motors, controls, and electrical distribution panels. It includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210221 Engineering I
- 210232 Electrical/Electronics Engineering

Complete (3) three credits:

- 460316 Circuits I (1.5 credits)
- 460319 Circuits II (1.5 credits)

Industrial Electrician Assistant CIP 46.0302.02

This pathway prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair electric apparatus and systems in residential, commercial, and industrial electric-power wiring, DC and AC motors controls, and electrical distribution panels. The pathway includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical inspecting and inspection, and applicable codes and standards. Instruction includes the principles of electronics and electrical systems, wiring, power transmission, safety industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards.

BEST PRACTICE COURSES

Complete (4) four credits:

- 460312 Electrical Construction 1
- 460316 Circuits I
- 460331 Electrical Motor Controls
- 460325 Rotating Machinery Electrical Motor Controls

Skilled Trades Construction Electrical Track CIP 46.0302.99

The Electrical Skilled Trades TRACK is designed as a pre-apprenticeship pathway for students to have the opportunity to enter a Registered Apprenticeship training program upon graduation. This Skilled Trades TRACK does not require an employer partner. Students must successfully complete the four course sequence, eight safety modules and an end of program assessment. Upon conclusion, the instructor will fill out a completion form and submit to OCTE. After being processed, the student will receive a pre-apprenticeship industry certification issued by the Kentucky Labor Cabinet. This certification will be recognized by participating partners for an interview and possible credit upon placement. Credit is at the discretion of the training organization.

For more information or a list of participating organizations, please visit the TRACK website.

BEST PRACTICE COURSES

Complete (4) four credits:

- 460312 Electrical Construction I
- 460313 Electrical Construction 11
- 460316 Circuits I
- 460319 Circuits II **OR** 460331 Electrical Motor Controls

ELECTRICAL TECHNOLOGY COURSES

Basic Blueprint Reading 499920

This course presents basic applied math, lines, multitier drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, threads and fasteners, and sketching typical to all shop drawings. Safety will be emphasized as an integral part of the course.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Receive an introduction to and review of math concepts including fractions and decimals.
2. Demonstrate the use of size and location dimensions.
3. Locate dimensions for centering of holes, points, and centers.
4. Identify the alphabet of lines.
5. Identify multiple views.
6. Arrange multiple views.
7. Arrange two-view drawings.
8. Identify one-view drawings.
9. Sketch and dimension shop drawings.
10. Calculate tapers and machined surfaces.
11. Demonstrate proper dimensions of cylinders and arcs.
12. Size dimensions of holes and angles.
13. Dimension parts using shop notes.
14. Calculate tolerances.
15. Identify labeling of various screw threads.
16. Arrange and identify auxiliary views.
17. Interpret the base line dimensions on drawings.
18. Identify half, full, and removed sections.
19. Interpret ordinate and tabular dimensions.
20. Sketch parts with irregular shapes.
21. Set tolerances using geometric dimensioning techniques.
22. Sketch oblique views of various parts.
23. Identify electrical schematic and diagram symbols.
24. Identify welding symbols and equipment.
25. Interpret connections and flow of various electrical, hydraulic, and pneumatic schematics and diagrams.

Basic Troubleshooting 499925

This course explores the science of troubleshooting and the importance of proper maintenance procedures; how to work well with others, aids in communication, and trade responsibilities; examines actual troubleshooting techniques, aids in troubleshooting, and how to use schematics and symbols; focuses on specific maintenance tasks such as solving mechanical and electrical problems, breakdown maintenance, and the how's and why's of planned maintenance.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Demonstrate workplace safety and knowledge.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe work site.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Demonstrate the following math and science concepts of Electricity.
    a. Demonstrate an understanding of Ohm's Law.
    b. Demonstrate an understanding of DC circuits.
    c. Demonstrate an understanding of AC circuits.
    d. Demonstrate an understanding of transformers.
3. Perform basic troubleshooting skills.
    a. Explain the reason efficient troubleshooting is important in a production plant.
    b. Demonstrate good communication skills when dealing with plant personnel.
    c. List the steps in troubleshooting a machine/system.
    d. List the questions that should be asked when a machine system fails.
    e. Identify a pictorial diagram, a blocking diagram, and a schematic diagram.
    f. Use schematics when troubleshooting.
    g. Identify differences in schematics when troubleshooting.
    h. Use a troubleshooting chart.

i. Identify current voltage characteristics of wire.
j. Demonstrate how to troubleshoot an electrical problem.
k. Identify bearing wear problems.
l. Identify pump failure problems and solutions.
m. Identify types of hosing.
n. List the information that should be recorded in a machine equipment record.
o. Identify calibration standards.
p. Identify preventive maintenance procedures.
q. List the signs of a machine in need of service.
r. List the questions that should be asked when a machine/system fails.
s. Identify different troubleshooting test equipment.
t. Apply all safety rules when working with electrical equipment.

Circuits I 460316

This course provides an introduction to basic theory of DC and AC circuits, including circuit analysis techniques, introductory magnetism, and transformer principles.

Recommended Grade Level: 9 – 12

Recommended Credit: 1 – 1.5

Students will:

1. Demonstrate workplace safety and knowledge for construction and industrial.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Demonstrate the following math and science concepts of electricity for construction and industrial.
    a. Demonstrate an understanding of Ohm's Law.
    b. Demonstrate an understanding of DC circuits.
    c. Demonstrate an understanding of AC circuits.
    d. Demonstrate an understanding of transformers.
3. Wiring Methods and Materials – National Electrical Code Articles 300-399: Construction and Industrial
    a. Exhibit previously learned knowledge of general wiring methods and materials.
    b. Locate information using conductors for general wiring.
    c. Demonstrate an understanding of conductors for general wiring.
    d. Apply knowledge of outlet, device, pull, and junction boxes, conduit bodies, fittings, and hand-hole enclosures.
    e. Apply knowledge of cables according to the National Electrical Code (Articles 320-340).
    f. Apply knowledge of raceways according to the National Electrical Code (Articles 342-399).

4. Circuits I:
    a. Demonstrate an understanding of resistance, capacitance, and inductance.
    b. Explain simple DC voltage and current divider circuits.
    c. Demonstrate an understanding of Ohm's Law and be able to perform a basic calculation.
    d. Solve simple time-constant circuits, both R-C and R-L.
    e. Solve series and parallel DC circuits.
    f. Understand basic theory of and applications to electric circuits for series circuits, parallel circuits, and series-parallel circuits.
    g. Demonstrate and understanding of basic transformers.
    h. Demonstrate basic soldering skills.
    i. Demonstrate verbal and written communication skills through teamwork and technical reports.
    j. Demonstrate an understanding of basic electrical measuring instruments such as those used for: voltage measurement, current measurement, and resistance measurement.
    k. Demonstrate proficiency in the use of common electrical laboratory instrumentation.
    l. Demonstrate an understanding of electrical safety principles.
    m. Describe the use of hand tools and basic test equipment.
    n. Demonstrate an understanding of basic magnetism and AC principles.

Circuits II 460319

This course covers complex alternating current and direct current circuits. Emphasis is on impedance, reactance, power and electrical energy, electrical measurement instruments, and circuit analysis.

Recommended Grade Level: 10 – 12

Recommended Credit: 1 to 1.5

Students will:

1. Demonstrate workplace safety and knowledge for construction.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Demonstrate the following math and science concepts of electricity for construction.
    a. Demonstrate an understanding of Ohm's Law.
    b. Demonstrate an understanding of DC circuits.
    c. Demonstrate an understanding of AC circuits.
    d. Demonstrate an understanding of transformers.
3. Explain the design of complex DC and AC series, parallel, and series/parallel circuits.
4. Use Kirchhoff's Laws, Thevenin, Norton, Loop, and Mesh analysis and superposition to solve AC and DC circuits.
5. Demonstrate an understanding of AC power, electrical energy, and power factor correction.
6. Demonstrate an understanding of transformers, single and 3-phase.
7. Exhibit a working knowledge of phasors and complex numbers (polar and rectangular forms).
8. Explain the design of simple low-pass, high-pass, and band-pass passive filter circuits.
9. Demonstrate a working knowledge of 3-phase AC.

10. Demonstrate verbal and written communication skills through teamwork and technical reports.
11. Demonstrate an understanding of Resonance in AC circuits.

Co-Op (Electrical) 460345

Co-op I (Electrical) provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance educational expenses.

Electrical Construction I 460312

This course involves the study of materials and procedures used in construction wiring.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Demonstrate workplace safety and knowledge for construction and industrial.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication including MSDS (Material Safety Data Sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Demonstrate the following math and science concepts of electricity for construction and industrial.
    a. Demonstrate an understanding of Ohm's Law.
    b. Demonstrate an understanding of DC circuits.
    c. Demonstrate an understanding of AC circuits.
    d. Demonstrate an understanding of transformers.
3. General – National Electrical Code Articles 100-110: Construction and Industrial:
    a. Exhibits previously learned material by recalling facts, terms, and basic concepts related to the National Electrical Code.
    b. Locate information using electrical installations regulation.
    c. Demonstrate an understanding of electrical installations regulation.
4. Wiring and Protection – National Electrical Code Articles 200-285: Construction and Industrial:
    a. Exhibits use and identification of grounded conductors.
    b. Interpret code regulations of branch circuits.
    c. Interpret code regulations of feeders.
    d. Apply branch-circuit, feeder, and service calculations.
    e. Interpret code regulations of services.

    f. Calculate overcurrent protection.
    g. Interpret code regulations of grounding and bonding.
5. Wiring Methods and Materials – National Electrical Code Articles 300-399: Construction and Industrial:
    a. Exhibits previously learned knowledge of general wiring methods and materials.
    b. Locate information using conductors for general wiring.
    c. Demonstrate an understanding of conductors for general wiring.
    d. Apply knowledge of outlet, device, pull, and junction boxes, conduit bodies, fittings, and handhole enclosures.
    e. Apply knowledge of cables according to the National Electrical Code (Articles 320-340).
    f. Apply knowledge of raceways according to the National Electrical Code (Articles 342-399).
6. Equipment for General Use – National Electrical Code Articles 400-490: Construction and Industrial:
    a. Interpret code regulations of equipment for general use such as cords, switches, and fixtures.
    b. Apply knowledge of luminaires, lamp holders, and lamps.
    c. Apply knowledge of appliances and equipment.
7. Electrical Construction I:
    a. Draw wiring diagrams to specifications.
    b. Compile a bill of materials from wiring diagrams drawn to specifications.
    c. Estimate total cost of a specific installation.
    d. Install temporary service (Article 590).
    e. Perform an inventory on equipment, materials, and supplies.
    f. Mark location of switches and outlets on studding.
    g. Use paper, wire, and pencil to perform layout calculations for ninety's offset and 3-point saddle.
    h. Locate room center for ceiling outlets.
    i. Mark location of single system components.
    j. Layout and install single and ganged boxes, both flush and surface mounted (new construction) (Article 314).
    k. Layout and install ganged boxes, both flush and surface mounted (old construction) (Article 314).
    l. Install line and low voltage thermostats (Article 424).
    m. Install communication outlets (Articles 314, 720).
    n. Introduce underground and overhead service entrances (Article 230).
    o. Install main distribution panel (Articles 110, 408).
    p. Install circuits using non-metallic sheathed cable (Article 334).
    q. Install and connect branch circuit grounding (Articles 210, 250).
    r. Install power feeder wiring system to equipment (Articles 215, 220, 225).
    s. Introduce non-metallic conduits for above and below ground installation (Article 352).
    t. Introduce conductors in conduit or raceway and terminate (Articles 310, 314).
    u. Introduce underground cable (Article 340) (300.5 Table).
    v. Install wire terminals and lugs (Article 110).

w. Make splices using approved methods (Article 110).
x. Install flexible and liquid tight conduit (Articles 348-350).
y. Install, identify, and label circuit breakers, fuses, and fuse adapter in distribution panels (including AFCI (Arc Fault Circuit Interrupter) breakers).
z. Test circuits for proper operation.
aa. Install lighting dimmer systems (Article 404).
bb. Install switches - single pole, three-way, and four-way (Article 404).
cc. Install duplex and special purpose receptacles including GFCI (Ground Fault Circuit Interrupter) (Articles 210, 406).
dd. Install lighting fixtures including incandescent, fluorescent, LED, recessed, and surfaced (Article 410).
ee. Install door chime, switches, and transformer (Articles 404, 450, 720).
ff. Install overhead fan or fanlight with controls (Article 314).
gg. Connect or troubleshoot water heaters (Article 422).
hh. Install single-phase dual voltage motors (Article 430).
ii. Test emergency lighting system.
jj. Complete an accident or incident report.
kk. Apply National Electrical Code (NEC (National Electric Code)) terms and concepts (Article 100).
ll. Summarize the NEC (National Electric Code) style (Article 90).
mm. Use formal methods in finding code requirements.
nn. Determine the purpose, scope, and enforcement of the NEC (National Electric Code) (Article 90).
oo. Examine the mandatory rules and formal interpretation of the NEC (National Electric Code).
pp. Apply definitions for proper understanding and application of the NEC (National Electric Code) rules (Article 100).
qq. Examine working space and working space entrances for electrical equipment (Article 110).

Electrical Construction II 460313

This course expands the knowledge and skills needed to work in commercial and industrial construction wiring.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate workplace safety and knowledge for construction and industrial.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Demonstrate the following math and science concepts of electricity for construction and industrial.
    a. Demonstrate an understanding of Ohm's Law.
    b. Demonstrate an understanding of DC Circuits.
    c. Demonstrate an understanding of AC Circuits.
    d. Demonstrate an understanding of transformers.
3. General – National Electrical Code Articles 100-110: Construction and Industrial
    a. Exhibit previously learned material by recalling facts, terms, and basic concepts related to the National Electrical Code.
    b. Locate information using electrical installations regulation.
    c. Demonstrate an understanding of electrical installations regulation.
4. Wiring and Protection – National Electrical Code Articles 200 – 285: Construction and Industrial
    a. Exhibits use and identification of grounded conductors.
    b. Interpret code regulations of branch circuits.
    c. Interpret code regulations of feeders.
    d. Apply branch-circuit, feeder, and service calculations.

    e. Interpret code regulations of services.
    f. Calculate overcurrent protection.
    g. Interpret code regulations of grounding and bonding.
5. Wiring Methods and Materials – National Electrical Code Articles 300 – 399: Construction and Industrial
    a. Exhibits previously learned knowledge of general wiring methods and materials.
    b. Locate information using conductors for general wiring.
    c. Demonstrate an understanding of conductors for general wiring.
    d. Apply knowledge of outlet, device, pull, and junction boxes, conduit bodies, fittings, and handhole enclosures.
    e. Apply knowledge of cables according to the National Electrical Code (Articles 320 – 340).
    f. Apply knowledge of raceways according to the National Electrical Code (Articles 342 – 399).
6. Equipment for General Use – National Electrical Code Articles 400 – 490: Construction and Industrial
    a. Interpret code regulations of equipment for general use such as cords, switches, and fixtures.
    b. Apply knowledge of luminaires, lamp holders, and lamps.
    c. Apply knowledge of appliances and equipment.
7. Electrical Construction II
    a. Using paper, wire, and pencil to perform layout calculations for ninety's offset, and 3 point saddle.
    b. Perform combination bends using EMT.
    c. Install rigid conduit (Article 344).
    d. Ground service to metallic bonding systems (Article 250).
    e. Draw external power diagrams.
    f. Install multi-conductor cable (Article 250).
    g. Install low-voltage lighting controls (Article 411).
    h. Lace cable and wires in open raceways and control panels (Articles 300, 336, 409).
    i. Install photo-electric control (Article 404).
    j. Install dynamic, switching, and resistive sensing devices.
    k. Draw control panel diagrams.
    l. Apply National Electrical Code (NEC (National Electric Code)) terms and concepts (Article 100).
    m. Summarize the NEC (National Electric Code) style (Article 90).
    n. Use formal methods in finding code requirements.
    o. Determine the purpose, scope, and enforcement of the NEC (National Electric Code) (Article 90).
    p. Examine the mandatory rules and formal interpretation of the NEC (National Electric Code).
    q. Apply definitions for proper understanding and application of the NEC (National Electric Code) rules (Article 100).
    r. Examine working space and working space entrances for electrical equipment (Article 110).

8. Additional tasks if provisions allow:
    a. Introduce electrical metallic tubing (Article 358).
    b. Introduce under-floor raceways (Article 390).
    c. Introduce lay-in duct work (wire ways) (Articles 376, 378).
    d. Introduce fiber optic cable in raceways (Article 770).
    e. Introduce explosion proof fixtures and devices (Article 501).
    f. Introduce feeder busways (Article 368).
    g. Introduce plug-in busways (Article 368).
    h. Introduce intercom and public address systems (Articles 800, 170, 110).
    i. Introduce snow and ice melting equipment (Article 426).
    j. Introduce emergency backup systems (rotary and solid-state types) (Article 700).
    k. Introduce cable and wires in open raceways and control panels (Articles 300, 336, 409).
    l. Introduce PC-based climate control equipment (Articles 440, 750).

Electrical Motor Controls 460331

This course addresses the diversity of control devices and applications used in industry today. Safety and electrical lockouts are also included.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate workplace safety and knowledge for construction and industrial.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Equipment for General Use – National Electrical Code Articles 400-490: Construction and Industrial
    a. Interpret code regulations of equipment for general use such as cords, switches, and fixtures.
    b. Apply knowledge of luminaires, lamp holders, and lamps.
    c. Apply knowledge of appliances and equipment.
3. Electrical Motor Controls: Construction and Industrial
    a. Connect pushbutton stations.
    b. Demonstrate an understanding of schematics (wiring diagrams and ladder diagrams).
    c. Connect control relay systems.
    d. Connect potential type motor-starting relays.
    e. Connect magnetic starters.
    f. Connect selector switches.
    g. Connect time delay relays.
    h. Connect sensing devices (non-electric).
    i. Connect overload relays into starting control circuits.

    j. Connect motor for automatic controls.
    k. Test magnetic starters.
    l. Connect reduced voltage starters.
    m. Connect motor control circuits for plugging.
    n. Connect automatic reduced voltage starter for DC motor control.
    o. Connect limit switches.
4. Additional tasks if provisions allow:
    a. Introduce point starters for DC motors.
    b. Introduce dynamic braking circuit for DC motors.
    c. Introduce dynamic braking circuit for AC motors.
    d. Introduce Programmable Logic Controls (PLC).

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply worksite and shop safety rules, and to apply OSHA (Occupational Safety and Health Administration) regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation.

Recommended Grade Level: 10 – 12

Recommended Credit: .5

Students will:

1. Introduce First Aid and CPR (cardiopulmonary resuscitation).
2. Apply worksite and lab safety procedures.
3. Apply personal safety rules and procedures.
4. Apply fire prevention rules and procedures.
5. Demonstrate hazardous communications procedures.
6. Describe and demonstrate universal precaution procedures.
7. Obtain 1926 Construction OSHA (Occupational Safety and Health Administration) 10 certification (recommended but not required).
8. Obtain first aid and CPR (cardiopulmonary resuscitation) certifications if time allows.

Internship (Electrical) 460348

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Internship do not receive compensation.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability after graduation.

National Electrical Code 460339

This course emphasizes the importance of the National Electrical Code as it applies to electrical installations: electrical safety issues, prevention of fire due to the use of electrical energy, prevention of loss of life and property from the hazards that might arise from the use of electrical energy, and proper selection of electrical equipment for hazardous and non-hazardous environments. This course provides a learning resource in the preparation for electrical licensing examinations.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Summarize the NEC (National Electric Code) style.
2. Use formal methods in finding code requirements.
3. Determine the purpose, scope, and enforcement of the NEC (National Electric Code).
4. Examine the mandatory rules and formal interpretation of the NEC (National Electric Code).
5. Determine guidelines for electrical equipment approval.
6. Apply National Electrical Code (NEC (National Electric Code)) terms and concepts.
7. Apply definitions for proper understanding and application of the NEC (National Electric Code) rules.
8. Utilize NEC (National Electric Code) rules for installing raceway systems and their associated wiring methods, including box size and conduit fill calculations.
9. Apply NEC (National Electric Code) tables to determine conductor size and de-rating factors for general wiring.
10. Apply NEC (National Electric Code) rules for conductor termination and splices.
11. Apply general code requirements for conductors, such as insulation markings, ampacity ratings, and their use.
12. Determine installation location and primary uses for a variety of cable and electrical raceways.
13. Determine the types and approval for use of flexible cords and cables.
14. Determine the rules for multi-wire branch circuits.
15. Apply NEC (National Electric Code) rules for receptacles and lighting in dwelling units.
16. Protect circuits with overcurrent protection devices, such as fuses and circuit breakers in a variety of locations and occupancies.
17. Utilize the NEC (National Electric Code) requirements for installing lighting fixtures, lamp holders, lamps and receptacles.
18. Size conductors and calculate overcurrent protection for a variety of appliances.
19. Calculate wire size for continuous and non-continuous loads.
20. Define feeder and how it relates to service and branch circuit conductors.
21. Calculate conductor and overcurrent protection size for feeder.
22. Demonstrate an understanding of the general requirements for all wiring methods by occupancy listed in the NEC (National Electric Code), including dwelling optional load calculations.

23. Examine working space and working space entrances for electrical equipment.
24. Utilize methods to identify disconnects and circuits.
25. Identify requirements for high-leg conductors.
26. Demonstrate an understanding of requirements for clearances, grounding, and raceways for outside branch circuits and feeders.
27. Utilize code requirements for service disconnecting means.
28. Determine NEC (National Electric Code) rules for overhead and lateral services.
29. Determine the number and grouping of service disconnect means by occupancy.
30. Apply the rules for working space and dedicated space for switchboards and panel boards.
31. Associate the difference between a grounded and neutral conductor.
32. Determine the purpose of a grounded conductor.
33. Differentiate between a grounded and grounding conductor.
34. Use methods to identify the grounded and grounding conductor.
35. Apply grounding to equipment through permitted NEC (National Electric Code) bonding and measures.
36. Identify bonding methods for services and communication equipment.
37. Determine when equipment is considered effectively grounded.
38. Utilize the NEC (National Electric Code) to determine disconnecting means, overcurrent protection and conductor sizing of air conditioning and refrigeration equipment.
39. Bond separately derived electrical systems.
40. Calculate primary and secondary overcurrent protection for transformers.
41. Determine the rules for temporary wiring on construction sites.
42. Apply code requirements for installing transformers and transformer vaults.
43. Determine installation requirements for electrical space heating, motors, motor circuits and controllers.

Renewable Energy Systems 460342

This course examines the need for alternative and renewable energy resources as a survey course providing citizens from all walks of life an understanding for responsible stewardships of technologies that will contribute to the sustainability of energy in our present and future societies. The object of this course is to take a more in-depth look at renewable energy forms and the replacement of fossil fuels in our society. Through wind, solar, and biomass this class will focus on live projects and scientific studies and comparisons of feasibility.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Define renewable energy.
2. Identify and describe different types of renewable energy.
3. Determine costs and tradeoffs of various renewable options.
4. Identify and describe sources of renewable energy and how they are delivered to customers.
5. Identify and describe the impact of renewable energy to the environment and the economy.
6. List and discuss overall issues associated with energy availability, effectiveness, distribution, and regulation.

Renewable Energy Systems (Special Problems) 460344

The object of this course is to take a more in-depth look at renewable energy forms and the replacement of fossil fuels in our society. Through scientific research methods, portfolio and presentations, students will focus on live projects, social energy issues, problems, and solutions using comparisons of feasibility.

Recommended Grade Level: 11 – 12

Recommended Credit: .5

Students will:

1. Complete selected tasks and problems as determined by the instructor.

Rotating Machinery 460323

This course focuses on the underlying principles of rotating electrical equipment including DC and AC motors and generating equipment construction, operating applications, and the maintenance of DC and AC motors and generating equipment.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate workplace safety and knowledge.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Describe the installation and measurement of DC series motor speed/torque characteristics.
3. Describe the installation and measurement of DC shunt motor speed/torque characteristics.
4. Describe the installation and measurement of DC compound motor speed/torque characteristics.
5. Describe the installation and measurement of DC series generator counter torque/voltage/speed characteristics.
6. Describe the installation and measurement of DC shunt generator counter torque/voltage/speed characteristics.
7. Describe the installation and measurement of DC compound generator counter torque/voltage/speed characteristics.
8. Explain how to change the output voltage of DC generators.
9. Explain how to vary the output voltage on AC alternators through field excitation.
10. Describe connection of instrumentation to measure frequency in AC alternators.

11. Describe how to parallel-connect two three-phase AC alternators so their voltages and frequencies are synchronized.
12. Use the National Electrical Code to size and install AC alternators.
13. Use electrical control equipment to vary the speed of single-phase AC motors.
14. Use mechanical and electrical instruments to measure the start and run torque of motors.
15. Explain how to vary the input voltage and measure speed/torque characteristics of single-phase AC motors.
16. Describe how to measure the speed/torque characteristics of capacitor-start, single-phase AC motors.
17. Use the National Electrical Code to size and install AC alternators.
18. Use electrical control equipment to vary the speed of single-phase AC motors.
19. Use mechanical and electrical instruments to measure the start and run torque of motors.
20. Explain how to vary the input voltage and measure speed/torque characteristics of single-phase AC motors.
21. Describe how to measure the speed/torque characteristics of capacitor-start, single-phase AC motors.
22. Describe how to measure the speed/torque characteristics of capacitor-run, single-phase AC motors.
23. Describe how to measure the speed/torque characteristics of repulsion-induction, single-phase AC motors.
24. Describe how to measure the speed/torque characteristics of shaded-pole, single-phase AC motors.
25. Describe how to measure the speed/torque characteristics of split-phase, single-phase AC motors.
26. Use manual and automatic means to change the direction of three-phase AC motors.
27. Utilize electrical control equipment to vary the speed of three-phase AC motors.
28. Configure three-phase AC motor stators to operate in delta.
29. Configure three-phase AC motor stators to operate in wye.
30. Explain how to measure the speed/torque characteristics of three-phase synchronous AC motors.
31. Explain how to measure the speed/torque characteristics of three-phase squirrel-cage AC motors.
32. Explain how to measure the speed/torque characteristics of three-phase wound-rotor AC motors.
33. Describe the preventative and permanent maintenance on AC and DC electrical rotary equipment.
34. Size feeder conductors and overcurrent protection for AC and DC rotating equipment according to the standards summarized in the National Electrical Code.

Rotating Machinery Electrical Motor Controls 460325

This course focuses on the construction, operation and maintenance of DC motors and generators and AC motors and alternators. This course addresses the diversity of control devices and applications used in industry today. Safety and electrical lockouts are also included.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate workplace safety and knowledge for industrial.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulation in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Equipment for General Use – National Electrical Code Articles 400-490: Industrial
    a. Interpret code regulations of equipment for general use such as cords, switches, and fixtures.
    b. Apply knowledge of luminaires, lamp holders, and lamps.
    c. Apply knowledge of appliances and equipment.
3. Rotating Machinery Electrical Motor Controls: Industrial
    a. Change the output voltage of alternators.
    b. Measure the frequency of alternators.
    c. Install two three-phase alternators in parallels.
    d. Install alternators.
    e. Change speed of single-phase motors.
    f. Measure the torque of motors.
    g. Connect single-phase motor to run on different voltages.
    h. Connect and test capacitor start motors.
    i. Connect and test capacitor run motors.
    j. Connect and test repulsion-induction motor.

k. Connect and test shaded pole motors.
l. Replace split-phase motors.
m. Change the direction of rotation of electrical motors.
n. Connect three-phase motors to run on different voltages.
o. Connect three-phase motor stator for delta operations.
p. Connect three-phase motor stator for star operations.
q. Connect and test synchronous motors.
r. Connect and test three-phase induction motors.
s. Connect and test wound rotor motors.
t. Install and test DC series motors for serviceability.
u. Install and test DC shunt motors for serviceability.
v. Install and test DC compound motors for serviceability.
w. Install and test DC series generators for serviceability.
x. Install and test DC shunt generators for serviceability.
y. Install and test DC compound generators for serviceability.
z. Change output voltages of DC generators.
aa. Connect control relay systems.
bb. Connect dynamic braking circuit for AC motors.
cc. Connect dynamic braking circuit for DC motors.
dd. Test magnetic starters.
ee. Connect overload relays into starting control circuits.
ff. Connect potential type motor starting relays.
gg. Connect reduced voltage starters.
hh. Connect time delay relays.
ii. Connect motor for automatic controls.
jj. Connect automatic reduced voltage starter for DC motor control.
kk. Connect control relay systems.
ll. Connect limit switches.
mm. Connect motor control circuits for plugging.
nn. Connect point starters for DC motors.
oo. Connect push button stations.
pp. Connect selector switches.
qq. Connect sensing devices (non-electric).
rr. Connect magnetic starters.

Special Problems – Electrical Technology 460377

This course is designed for the student who has demonstrated specific special needs.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Complete selected tasks and problems as determined by the instructor.

Special Topics – Electrical Technology 460399

Instruction related to Electrical Technology but not described in the other courses.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 – 1

Students will:

1. Complete selected tasks and problems as determined by the instructor.

Sustainable Energy Systems 460340

This course examines the sustainability of various energy resources. An overview of energy technology, energy resources, and emerging future energy technologies coupled with our energy use will bring into context the strengths and weaknesses of different energy methodologies in developing a working concept of sustainable energy.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate workplace safety and knowledge.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Sustainable Energy Systems:
    a. Define sustainable energy.
    b. Define and convert various common energy sources to units of measurements in terms of BTUs of energy and power in terms of Watts.
    c. Demonstrate a basic understanding of the physics of heat.
    d. Explain how energy systems interact with local, regional and global environments.
    e. Analyze the basic operation of passive and active solar energy systems and associated sustainability issues.
    f. Describe the basic operation of tidal energy systems and associated sustainability issues.
    g. Explain the basic operation of wind energy systems and associated sustainability issues.
    h. Describe the basic operation of fossil fuel energy systems and associated sustainability issues.

i. Describe the basic operation of nuclear power energy systems and associated sustainability issues.
j. Explain how renewable energy systems contribute to the sustainability of energy sources.
k. Describe the basic operation of biomass energy systems and associated sustainability issues.
l. Describe the basic operation of hydropower systems and associated sustainability issues.
m. Assess the basic operation of electrical power generation and associated sustainability issues.
n. Categorize the sustainability issues associated with residential and commercial building designs.

Transformers 460305

This course focuses on the operation, installation and application of AC single-phase and three-phase transformers. Testing and maintaining transformer equipment are emphasized, with safety integrated and as a core component of the study.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate workplace safety and knowledge.
    a. Identify equipment and materials of the trade.
    b. Identify safe and proper use of tools of the trade.
    c. Identify the characteristics of a safe worksite.
    d. Identify OSHA (Occupational Safety and Health Administration)'s 1926.10 Construction Standards and who enforces OSHA (Occupational Safety and Health Administration) Rules and Regulations in Kentucky.
    e. Identify and use personal protective equipment.
    f. Demonstrate ladder safety.
    g. Demonstrate electrical safety including GFCI (Ground Fault Circuit Interrupter), cord use, and grounding.
    h. Identify different types of chemical, biological, and physical hazards.
    i. Interpret hazardous chemical communication such as MSDS (material safety data sheet) and HAZWOPER (Hazardous Waste Operations and Emergency Response).
    j. Demonstrate knowledge and understanding of blood borne pathogens.
    k. Demonstrate knowledge and understanding of blueprints including symbols, specifications, and layout.
    l. Demonstrate knowledge and understanding of schematics and line diagrams.
2. Transformers:
    a. Connect a dual voltage transformer for its highest input and output voltages.
    b. Connect a dual voltage transformer for the low voltage input and output.
    c. Connect an ammeter to high voltage line using a current transformer.
    d. Connect an auto transformer to give a variety of voltages.
    e. Connect transformers to supply 3-phase power, 4-2 configuration.
    f. Connect transformers to supply 3-phase power, delta configuration.
    g. Connect transformers to supply 3-phase power, Y configuration.
    h. Connect the secondary of a 3-phase bank to give a 4-wire delta system.
    i. Connect 3 single-phase transformers to form a delta-delta configuration.
    j. Connect 3 single-phase transformers to form a delta-star configuration.
    k. Connect 3 single-phase transformers to form a star-delta 3-phase bank.
    l. Connect 3 single-phase transformers to form a star-star 3-phase bank.
    m. Connect 2 single-phase transformers in an open-delta configuration.
    n. Connect 2 single-phase transformers in parallel.
    o. Connect a voltmeter using a potential transformer to determine voltage.

p. Test transformer for output and performance under resistive, capacitive, and inductive loads.
q. Connect buck-boost transformer to increase voltage.
r. Connect buck-boost transformer to decrease voltage.

HEAVY EQUIPMENT SCIENCES CAREER PATHWAYS

Construction TRACK CIP 46.0000.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK website.

BEST PRACTICE COURSES

Complete (4) four credits:

Complete a minimum of four (4) courses chosen from the partnering technical center's construction course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

Heavy Equipment Sciences CIP 49.0202.01

The Heavy Equipment Sciences program will prepare students for construction building jobs, infrastructures projects (roads, bridges, and ports, otherwise called non-building construction), and in mining and timber operations. A trained and experienced equipment operator provides necessary skills for any project that requires moving and transporting heavy materials or that demands any kind of earthmoving.

BEST PRACTICE COURSES

Complete (3) three credits:

- 460201 Introduction to Construction Technology
- 460403 Heavy Highway Construction Equipment Repair
- 460404 Heavy Equipment Operation

Choose (1) one credit from the following:

- 460499 Special Topics—Heavy Equipment
- 499925 Basic Troubleshooting

HEAVY EQUIPMENT SCIENCES COURSES

Basic Blueprint Reading 499920

This course presents basic applied math, lines, multitier drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, threads and fasteners, and sketching typical to all shop drawings. Safety will be emphasized as an integral part of the course.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Complete introduction and math review (fractions and decimals).
2. Demonstrate the use of size and location dimensions.
3. Locate dimensions for centering of holes, points, and centers.
4. Identify the alphabet of lines.
5. Identify multiple views.
6. Arrange multiple views.
7. Arrange two-view drawings.
8. Identify one-view drawings.
9. Sketch and dimension shop drawings.
10. Calculate tapers and machined surfaces.
11. Demonstrate proper dimensions of cylinders and arcs.
12. Size dimensions of holes and angles.
13. Dimension parts using shop notes.
14. Calculate tolerances.
15. Identify labeling of various screw threads.
16. Arrange and identify auxiliary views.
17. Interpret the base line dimensions on drawings.
18. Identify half, full, and removed sections.
19. Interpret ordinate and tabular dimensions.
20. Sketch parts with irregular shapes.
21. Set tolerances using geometric dimensioning techniques.
22. Sketch oblique views of various parts.
23. Identify electrical schematic and diagram symbols.
24. Identify welding symbols and equipment.
25. Interpret connections and flow of various electrical, hydraulic, and pneumatic schematics and diagrams.

Basic Troubleshooting 499925

This course explore the science of troubleshooting and the importance of proper maintenance procedures; how to work well with others, aids in communication, and trade responsibilities; examines actual troubleshooting techniques, aids in troubleshooting, and how to use schematics and symbols; focuses on specific maintenance tasks such as solving mechanical and electrical problems, breakdown maintenance, and the how's and why's of planned maintenance.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Explain the reason efficient troubleshooting is important, including pre-operation checks.
2. Demonstrate good communication skills.
3. List the steps in troubleshooting a machine/system.
4. List the questions that should be asked when a machine system fails.
5. Identify a pictorial diagram, a blocking diagram, and a schematic diagram.
6. Use schematics when troubleshooting.
7. Identify differences in schematics when troubleshooting.
8. Use a troubleshooting chart.
9. Identify current voltage characteristics of wire.
10. Demonstrate how to troubleshoot an electrical problem.
11. Identify bearing wear problems.
12. Identify pump failure problems and solutions.
13. Identify types of hosing.
14. List the information that should be recorded in a machine equipment record.
15. Identify calibration standards.
16. List preventive maintenance procedures.
17. List the signs of a machine in need of service.
18. List the questions that should be asked when a machine/system fails.
19. Identify different troubleshooting test equipment.
20. Apply all safety rules when working with electrical equipment.

Heavy Equipment Operation 460404

This course introduces students to the basic terminology and equipment used in the heavy equipment trade; working around heavy equipment in a safe and responsible manner; commonly used heavy equipment machines, including dump trucks, trenchers, backhoes, excavators, skid steer, and dozers; drive systems and hydraulic systems; pre-operational checks and operator maintenance tasks for heavy equipment; basic tractor operation, controls, attachments, maintenance, and safety guidelines; basic concepts and procedures related to the use of heavy equipment to perform earthmoving work; preparing graded surfaces using heavy equipment; identification and interpretation of construction stakes; and describes the methods for grading slopes. Students will learn what tasks are expected from an apprenticeship program in heavy equipment.

Recommended Grade Level: 9 – 12

Recommended Credit: 1 – 5

Students will:

1. Explain basic terminology, types, and uses of equipment.
2. Identify career opportunities available to heavy equipment operators and explain the purpose and objectives of an apprentice training program.
3. Explain the responsibilities and characteristics of a good operator.
4. Explain the importance of heavy equipment safety.
5. Demonstrate how to use various types of personal protective equipment (PPE).
6. Place barricades and temporary traffic control devices for a highway construction zone.
7. Demonstrate how to use flags or paddles to control traffic.
8. Identify the various types of heavy equipment and their uses.
9. Perform basic prestart inspection, startup, operational movement, and shutdown for different heavy equipment.
10. Properly start, warm up, and shut down a gasoline-powered and diesel-powered engine tractor.
11. Perform basic maneuvering with a tractor.
12. Attach implements to a drawbar and three-point hitch.
13. Attach and detach implements to a power takeoff.
14. Draw a plan for basic earthmoving operations.
15. Lay out a basic earthmoving operation.
16. Identify and select the proper equipment for a given earthmoving operation.
17. Identify types of stakes and markings on stakes.
18. Check horizontal and vertical distances of cut and fill slope stakes.
19. Check finish subgrade on a cross slope.

Heavy Highway Construction Equipment Repair 460403

This course introduces students to perform preventive maintenance, diagnose malfunction, prescribe corrective actions, and repair heavy highway equipment.

Recommended Grade Level: 9 – 12

Recommended Credit: 1 – 5

Students will:

1. Identify the basic parts of each type of equipment and explain the differences in models of type of equipment.
2. Identify and explain the systems that make up the drive system used on heavy equipment.
3. Explain the basics of a hydraulic system and identify hydraulic components.
4. Describe the different types of transmissions used on utility tractors.
5. Perform prestart inspection and maintenance procedures.
6. Inspect different types of heavy equipment.
7. Perform preventive maintenance.
8. Diagnose malfunction.
9. Prescribe corrective action.
10. Repair machinery used in construction, farming, rail transportation, and other industries.

Industrial Education Co-op 499910

Cooperative Education for CTE (career and technical education) courses indicated within the KY Department of Education provides supervised work site experience related to the student's identified career major. Students who participate receive a salary for these experiences in accordance with local, state, and federal minimum wage requirements.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Industrial Education Internship 499915

Internship for CTE (career and technical education) courses provides supervised work-site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom/lab studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply work site and shop safety rules, and to apply OSHA (Occupational Health and Safety Administration) regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation if provisions allow.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Demonstrate skills in First Aid and CPR (cardiopulmonary resuscitation).
2. Apply worksite and lab safety procedures.
3. Apply personal safety rules and procedures.
4. Apply fire prevention rules and procedures.
5. Demonstrate hazardous communications procedures.
6. Describe and demonstrate universal precaution procedures.
7. Obtain 1926 Construction OSHA (Occupational Safety and Health Administration) 10 certification. This task is recommended but not required.

Introduction to Construction Technology 460201

This course is the introduction to the construction carpentry industry. The class will emphasize safe and proper methods of operating hand tools, portable power tools, and stationary power tools in the construction industry.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Identify the proper use of personal protection equipment and general job safety.
2. Identify and use various types of building materials.
3. Identify and use various types of fasteners, anchors, and adhesives used in the construction industry.
4. Identify the actual and nominal sizes of lumber.
5. Perform mathematics functions as related to tasks being performed.
6. Demonstrate the safe and proper use of the following types of hand tools: fastening devices, layout and measuring devices, leveling devices, and edge cutting devices.
7. Demonstrate the safe and proper use of the following types of portable power tools: various saws, surfacing and shaping tools, drills, and pneumatic tools.
8. Build a project using tools of the trade: sawhorse, shop bench, tool box, picnic table.

Special Topics – Heavy Equipment 460499

Instruction related to Industrial Education – Heavy Equipment but not described in the other courses.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 – 1

Students will:

1. Complete selected tasks and problems as determined by the instructor.

MASONRY TECHNOLOGY CAREER PATHWAYS

Bricklayer Assistant CIP 46.0101.01

This program prepares individuals to apply technical knowledge and skills in the laying and/or setting of exterior brick, concrete block, hard tile, marble and related materials, using trowels, levels, hammers, chisels, and other hand tools. Instruction includes technical mathematics, blueprint reading, structural masonry, decorative masonry, foundations, reinforcement, mortar preparation, cutting and finishing, and applicable codes and standards.

BEST PRACTICE COURSES

Complete (4) four credits:

- 460112 Introductory Masonry
- 460116 Intermediate Masonry
- 499930 Industrial Safety (.5 credit course) **AND** 499920 Basic Blueprint Reading (.5 credit course)
- 460180 Co-op (Masonry) **OR** 460183 Internship (Masonry)

Construction TRACK CIP 46.0000.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities with employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer, and the student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please visit the TRACK website.

BEST PRACTICE COURSES

Complete (4) four credits:

Complete a minimum of four (4) courses chosen from the partnering technical center's construction course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

Skilled Trades Masonry TRACK CIP 46.0101.99

The Masonry Skilled Trades TRACK is designed as a pre-apprenticeship pathway for students to have the opportunity to enter a Registered Apprenticeship training program upon graduation. This Skilled Trades TRACK does not require an employer partner. Students must successfully complete the four-course sequence, eight safety modules and an end-of-program assessment. Upon conclusion, the instructor will fill out a completion form and submit to OCTE. After being processed, the student will receive a pre-apprenticeship industry certification issued by the Kentucky Labor Cabinet. This certification will be recognized by participating partners for an interview and possible credit upon placement. Credit is at the discretion of the training organization.

For more information or a list of participating organizations, please visit the TRACK website.

BEST PRACTICE COURSES

Complete (4) four credits:

- 460112 Introductory Masonry
- 460116 Intermediate Masonry
- 460113 Advanced Masonry
- 499930 Industrial Safety (.5 credit course) **AND** 499920 Basic Blueprint Reading (.5 credit course)

MASONRY TECHNOLOGY COURSES

Advanced Masonry 460113

The advanced course provides experience in laying quoin corners, bricking in around electrical and plumbing units, and laying door and window brick sills. The student will construct expansion joints, piers, pilasters, and retaining and split face block walls.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Estimate masonry materials needed for the job.
2. Tooth a wall or corner.
3. Brick in electrical, plumbing, and air conditioning fixtures.
4. Lay door and window brick sills.
5. Clean walls with acid.
6. Determine elevations of foundation brick shelves.
7. Secure electrical, plumbing, and air conditioning fixtures, lines, and ducts in walls.
8. Lay block in a stack bond.
9. Construct expansion joints.
10. Construct piers.
11. Construct pilasters.
12. Construct a retaining wall.
13. Lay split face block walls.

Anchors and Reinforcement 460117

This course presents different types of reinforcement used in masonry units such as installing wall ties and reinforcing wire, tying intersecting walls with metal ties, installing masonry anchor bolts, setting and anchoring door and window frames, and setting steel lintels and bearing plates. Students will also install dovetail ties to concrete, set preformed masonry lintels, and lay paving brick in a herringbone pattern.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Install wall ties.
2. Install reinforcing wire.
3. Tie intersecting walls with metal ties.
4. Install anchor bolts.
5. Set and anchor door and window frames.
6. Set steel lintels.
7. Set preformed masonry lintels.
8. Build a reinforced block lintel in place.
9. Set bearing plates.
10. Install dovetail ties to concrete.

Basic Blueprint Reading 499920

This course presents basic applied math, lines, multi-view drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, threads and fasteners, and sketching typical to all shop drawings. Safety will be emphasized as an integral part of the course.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Complete an introduction and math review (fractions and decimals)—required content for Masonry Apprenticeship program.
2. Identify the alphabet of lines--required content for Masonry Apprenticeship program.
3. Identify multiple views-- required content for Masonry Apprenticeship program.
4. Arrange multiple views.
5. Arrange two-view drawings.
6. Identify one-view drawings-- required content for Masonry Apprenticeship program.
7. Arrange and identify auxiliary views.
8. Demonstrate the use of size and location dimensions.
9. Demonstrate proper dimensions of cylinders and arcs-- required content for Masonry Apprenticeship program.
10. Size dimensions of holes and angles.
11. Locate dimensions for centering of holes, points, and center.
12. Interpret the base line dimensions on drawings.
13. Identify half, full, and removed sections.
14. Identify electrical schematic and diagram symbols.
15. Identify welding symbols and equipment.
16. Interpret ordinate and tabular dimensions.
17. Set tolerances using geometric dimensioning techniques.
18. Sketch parts with irregular shapes.
19. Sketch oblique views of various parts.
20. Sketch and dimension shop drawings.
21. Dimension parts using shop notes.
22. Calculate tolerances.
23. Identify labeling of various screw threads.
24. Calculate tapers and machined surfaces.
25. Interpret connections and flow of various electrical, hydraulic, and pneumatic schematics and diagrams.
26. Demonstrate understanding of scaling of an architect's ruler.

Concrete Finishing 460119

The focus of this course is the composition of concrete; define the advantages of air-entrained concrete, learn how concrete is tested for strength requirements, and the steps in preparing, placing, finishing, and curing concrete. The student will be able to describe how floors, steps, footers, and pads are laid out and constructed, become familiar with construction safety practices and learn the safe and proper use of hand, portable and stationary power tools. In addition, students will develop a working knowledge of construction procedures utilized in residential and commercial construction.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Prepare wood and steel forms.
2. Prepare for pouring.
3. Install expansion joints.
4. Pour concrete.
5. Screed concrete.
6. Finish concrete by hand.
7. Finish concrete by machine.
8. Estimate cubic yards.
9. Pour concrete footers and pads.
10. Set grade stakes for footers.
11. Identify different types of concrete finishes.
12. Run a power screed.
13. Set forms.
14. Saw expansion joints.
15. Identify joint materials.
16. Add color to concrete.
17. Stamp concrete.
18. Set grade stakes.
19. Texture concrete.
20. Run a bull float.
21. Run an edger.
22. Use a finish trowel.
23. Determine concrete placement.

Co-op (Masonry) 460180

Coop I provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Fireplace Construction 460118

This course presents different types and styles of indoor and outdoor fireplaces and the principles of layout, drafting, and drawing a fireplace. Finishing dimensions of fireplace opening, firebox layout, setting the flue lining, and applying a chimney cap are also included.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Layout fireplaces.
2. Build ash pits with clean-out doors.
3. Enclose prefabricated fireboxes.
4. Install grills and ducts for prefabricated fireboxes.
5. Install fireplace inserts.
6. Lay brick with fireclay or high temperature mortar.
7. Construct firebox with ash dumps.
8. Install dampers.
9. Construct smoke chambers with smoke shelves.
10. Install flue liners.
11. Cut flue liners with hand tools.
12. Install thimbles.
13. Build chimneys.
14. Install roof flashing in joints and regrets.
15. Cap off chimney.

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply work site and shop safety rules, and to apply OSHA regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation if provisions allow.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Be introduced to First Aid and CPR.
2. Apply work site and lab safety procedures.
3. Apply personal safety rules and procedures.
4. Apply fire prevention rules and procedures.
5. Demonstrate hazardous communications procedures.
6. Describe and demonstrate universal precaution procedures.
7. Obtain 1926 Construction OSHA 10 certification. This task is recommended but not required.
8. Identify and explain OSHA's regulations to exposure to Respirable Crystalline Silica. Respirable Crystalline Silica is specific to Masonry.

Intermediate Masonry 460116

This course builds on proficiency in competencies learned in MASE 105. It focuses on laying straight and plumb brick to the lines, emphasizing bricking gables and building columns. Laboratory is a part of the course.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Proportion and mix mortars manually with a hoe and mortar box.
2. Set up and maintain a mortar mixer.
3. Proportion and mix mortar with electric and gasoline powered mixers.
4. Set up and maintain masonry saws.
5. Stock a mortar board or pan.
6. Temper mortar.
7. Layout building lines using the 6-8-10 method.
8. Determine coursing with a brick spacing rule and with a modular mason's rule.
9. Drop jack lines.
10. Set corner poles for veneer.
11. Plumb and level with a mason's two (2') and four (4') foot levels.
12. Gauge-plumb with a plumb bob.
13. Chalk a line.
14. Set lines, pins, block and twigs.
15. Inspect, assemble and disassemble rigging and scaffolding.
16. Carry brick with tongs.
17. Cut masonry materials with hand tools.
18. Cut materials with a masonry saw.
19. Identify brick types.
20. Spread mortar for brick.
21. Make head joints for brick.
22. Square corners with a 2' framing square.
23. Lay inside and outside brick corner leads.
24. Gauge masonry walls with a mason's modular rule.
25. Dry bond brick.
26. Bond a brick wall for range with a rule.
27. Lay brick to a line while holding bond.
28. Tuck-point a wall including skate rake and concave joint.
29. Finish joints with a variety of tools.
30. Identify types of block.
31. Layout block corners and walls with a tape measure.
32. Bond corners for all widths of block.
33. Spread mortar for block.
34. Lay inside and outside block corner leads.
35. Lay a block wall to a line.

36. Lay closure block/brick.
37. Bond corners for all widths of block.
38. Install foundation vents.
39. Top out veneer walls behind frieze boards.
40. Brick a gable.
41. Build brick columns.

Internship (Masonry) 460183

The Practicum provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Practicum do not receive compensation.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Introductory Masonry 460112

This course introduces various types of mortar and cement along with the use of basic masonry tools. It emphasizes the different methods of spacing materials on a construction site, the 6-8-10 method, and the use of the transit level, brick spacing, and modular rule. It also focuses on laying straight and plumb brick to the line, bricking gables and building columns. It permits application techniques for setting up different types of masonry materials, marking off layout lines, and erecting batter boards along with techniques employed in different types of weather and climates. Laboratory is part of the class.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Demonstrate a safe environment according to best practices in the Masonry industry and OSHA standards.
2. Proportion and mix mortars manually with a hoe and mortar box.
3. Set up and maintain a mortar mixer.
4. Proportion and mix mortar with electric and gasoline powered mixers.
5. Setup and maintain masonry saws.
6. Stock a mortar board or pan.
7. Temper mortar.
8. Layout building lines using the 6-8-10 method.
9. Square corners with a framing square.
10. Determine coursing with a brick spacing rule and with a modular mason's rule.
11. Determine coursing with a modular mason's rule.
12. Drop jack lines.
13. Set corner poles for veneer.
14. Set freestanding corner poles.
15. Plumb and level with a mason's two (2') and four (4') foot levels.
16. Plumb with a plumb bob.
17. Chalk a line.
18. Set lines, pins, blocks, and twigs.
19. Inspect, assemble, and disassemble rigging and scaffolding.
20. Carry brick with tongs.
21. Cut masonry materials with hand tools.
22. Cut materials with a masonry saw.
23. Identify brick types.
24. Spread mortar for brick.
25. Make head joints for brick.
26. Lay inside and outside brick corner leads.
27. Gauge masonry walls with a mason's modular rule.
28. Dry bond brick.
29. Bond a brick wall for range with a rule.
30. Lay brick to a line while holding bond.

31. Tuck-point a wall.
32. Finish joints with a variety of tools.
33. Identify types of block.
34. Layout block corners and walls with a tape measure.
35. Bond corners for all widths of block.
36. Square corners with a 2’ framing Square.
37. Spread mortar for block.
38. Lay inside and outside block corner leads.
39. Lay a block wall to a line.
40. Lay closure block/brick.
41. Lay 4” partition block walls and cap block.
42. Install foundation vents.

Residential Maintenance Masonry 460114

This course covers the basic aspects of masonry as it relates to the residential structure. Emphasis is placed on proper handling, mixing, placing, and finishing of Portland cement products.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Practice safe masonry procedures.
2. Use masonry trowels, hammers, and chisels.
3. Proportion and mix concrete.
4. Install concrete.
5. Edge, joint, and finish concrete.
6. Measure and mix mortar with a hoe and mortar box.
7. Repair/replace bricks.
8. Repair/replace concrete blocks.
9. Tuck-point walls.
10. Cut masonry materials with hand tools.
11. Cut masonry materials with a circular saw.
12. Clean and maintain masonry tools.
13. Estimate masonry materials.
14. Store masonry tools, materials, and equipment.

Special Problems 460179

This course is designed for the student who has demonstrated specific special needs.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Complete selected tasks/problems as determined by the instructor.

PLUMBING TECHNOLOGY CAREER PATHWAYS

Construction TRACK CIP 46.0000.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities with employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK website.

BEST PRACTICE COURSES

Complete (4) four credits:

Complete a minimum of four (4) courses chosen from the partnering technical center's construction course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

Plumber Assistant CIP 46.0501.02

This pathway prepares individuals to practice as licensed plumbers by applying technical knowledge and skills to layout, assemble, install, and maintain piping fixtures and systems for steam, natural gas, oil, hot water, heating, cooling, drainage, lubricating, sprinkling, and industrial processing systems in home and business environments. It includes instruction in source determination, water distribution, waste removal, pressure adjustment, basic physics, technical mathematics, blueprint reading, pipe installation, pumps, welding and soldering, plumbing inspection, and applicable codes and standards.

BEST PRACTICE COURSES

Complete (2) two credits:

- 460511 Introduction to Plumbing
- 460513 Basic Plumbing Skills

Choose (2) two credits from the following:

- 460512 Plumbing Systems
- 460514 Bathroom Install
- 460515 Kitchen Install
- 460518 Co-op (Plumbing) **OR** 460521 Internship (Plumbing)

PLUMBING TECHNOLOGY COURSES

Basic Plumbing Skills 460513

This course introduces the student to basic pipe joining techniques.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Make a measurement with a rule.
2. Measure, cut, ream, and thread steel pip using hand tools.
3. Measure, cut, and ream steel pipe using power equipment.
4. Join steel pipe and fitting.
5. Cut cast iron using a hammer and chisel and other tools.
6. Cut cast iron pipe using snap chain cutter or wheel cutter.
7. Join cast iron pipe and fittings using lead and oakum.
8. Join cast iron pipe and fittings using a compressed gasket.
9. Join cast iron pipe using no-hub clamp.
10. Measure and cut copper pipe using hacksaw and tubing cutters and ream.
11. Join copper pipe and fittings using soldering method.
12. Join copper pipe and fittings using flare method.
13. Join copper pipe and fittings using compression method.

Bathroom Install 460514

This course will develop the skills necessary to rough-in and install a bathroom group and auxiliary fixtures for residential or commercial applications.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Rough in waste and vent pipes for build-in lavatories.
2. Rough in the water supply for lavatory.
3. Install a lavatory.
4. Rough in waste and vent pipes for floor mount water closet.
5. Rough in the water supply for water closer.
6. Install a water closet.
7. Rough in waste and vent pipes for bathtub.
8. Rough in the water supply for bathtub.
9. Install a bathtub.
10. Install urinal and bidet.
11. Rough in waste and vent pipes for shower bath.
12. Rough in the water supply for shower.
13. Install shower bath.

Co-op (Plumbing) 460518

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply work site and shop safety rules, and to apply OSHA regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Introduce First Aid and CPR
2. Apply worksite and lab safety procedures.
3. Apply personal safety rules and procedures.
4. Apply fire prevention rules and procedures.
5. Demonstrate hazardous communications procedures.
6. Describe and demonstrate universal precaution procedures.
7. Obtain 1926 Construction OSHA 10 certification. This task is recommended but not required.
8. Obtain first aid and CPR certifications (if provisions allow).

Internship (Plumbing) 460521

The Practicum provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Practicum do not receive compensation.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Introduction to Plumbing 460511

This course introduces the origin and basic principles of the plumbing industry. Also included is the orientation of methods associated with the plumbing industry.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Read a ruler.
2. Work with hand tools.
3. Work with power tools.
4. Work with steel pipe, tools, and methods.
5. Learn cast iron pipe methods of cutting.
6. Learn methods of joining cast iron pipe.
7. Work with copper tubing.
8. Learn methods of joining copper pipe.
9. Work with PVC and ABS plastics.
10. Work with PVC and CPVC water pipe.
11. Learn methods of joining different pipe materials.
12. Learn methods of pipe support.
13. Apply for a job.
14. Join copper pipe and fittings using the flaring method.
15. Join copper pipe and fittings using the compression method.
16. Bend copper pipe using spring benders.
17. Cut plastic pipe.
18. Join plastic pipe using the solvent weld and thermo welding methods.
19. Join plastic pipe using insert and threaded fittings.
20. Join pipes of different types.
21. Cut woodwork for drain, waste, and vent pipes.
22. Install fixture supports.
23. Inventory plumbing fixtures and supplies.
24. Secure pipes to wood structures.
25. Secure pipes to concrete structures.
26. Secure pipes to metal structures.
27. Install water hammer arrestors.
28. Install wall hydrants.
29. Install yard hydrants.
30. Thaw frozen water pipes.
31. Insulate water pipes.
32. Apply for a plumbing-related job.

Kitchen Install 460515

This course will develop the skills necessary to rough in and install a kitchen group and laundry fixtures for residential and commercial applications.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Rough in waste and vent pipes for kitchen sink.
2. Rough in the water supply for kitchen sink.
3. Install a kitchen sink.
4. Install garbage disposal unit.
5. Install dishwasher opening.
6. Rough in waste and vent pipes for automatic washer.
7. Rough in the water supply for automatic washer.

Plumbing Systems 460512

This course presents a study of designing and sizing water distribution, drain, waste, and vent pipes, in addition to studies of code requirements and installation of common residential fixtures.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Identify drain, waste, and vent.
2. Learn code sizing of DWV.
3. Size a bathroom group.
4. Identify water distribution.
5. Learn the sizes of the water lines for a bathroom group.
6. Learn how to set a water closet.
7. Learn how to set a lavatory.
8. Learn how to install a bathtub.
9. Learn how to install a shower.
10. Learn the sizing of the kitchen and laundry.
11. Learn how to install a kitchen sink unit.
12. Identify auto-washer openings.
13. Learn cross-connections.
14. Install other plumbing fixtures.

Special Problems – Plumbing 460599

This course is designed for the student who has demonstrated specific special needs.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 - 1

Students will:

1. Complete selected tasks/problems as determined by the instructor.

EDUCATION AND TRAINING

EDUCATION AND TRAINING CAREER PATHWAYS

Teaching and Learning CIP 13.0101.00

This pathway focuses on the general theory and practice of learning and teaching, the basic principles of educational psychology, the art of teaching, the planning and administration of educational activities, school safety and health issues, and the social foundations of education.

BEST PRACTICE COURSES

Complete (3) three credits:

- 331030 The Learning Community
- 331031 The Learner-Centered Classroom
- 331032 The Professional Educator

Choose (1) one credit from the following:

- 331033 Collaborative Clinical Experience
- 331034 Principles of Career and Technical Education
- An IB, AP, or Dual Credit course in intended teaching discipline

EDUCATION AND TRAINING COURSES

Collaborative Clinical Experience 331033

In this course, students will refine the required knowledge and skills to be an effective educator while also practicing the dispositions necessary for the educational profession. Specifically, students will gain an understanding of how teachers lead through individual and collaborative growth and reflection. Students participate in clinical experiences. This is a work-based learning experience where students should spend almost all of their time in a classroom learning setting appropriate to their intended teaching discipline.

Prerequisites: The Learning Community 331030 **AND** The Learner-Centered Classroom 331031

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Know how their previous study from the earlier courses relates to their experiences in the clinical setting, understand how teachers use reflective practice in refining and developing new skills, dispositions, and understanding, and practice growth through reflection is critical.
2. Know the critical dispositions of teachers, understand how teachers' mindset and habits impact teaching, and practice developing and growing reflective practice and leadership in order to improve themselves, others and teams.
    a. Improvement: growth mindset, reflective habits of mind, improvement, intention and purpose, building a professional network for support, seeking feedback, mentoring.
    b. Leadership: common characteristics of successful leaders, credibility, unpack concept of credibility and trustworthiness, habits of effective speakers.
    c. Collaborate with colleagues and administrators.
3. Know potential career pathways, roles and opportunities, understand the importance of quality professional development and networks of support, and practice reflecting on their personal path including researching colleges, selecting a job and being an ambassador for the profession.
4. Know the expectations of being a professional (code of ethics, unpacking the Educators Rising standards report and professional skills and terminology), understand how teachers use research to stay current and practice professional behavior and growth.

The Learner-Centered Classroom 331031

This course will develop rising educators' awareness of their funds of knowledge, as well as their personal biases that develop from their life experiences. Using research-based methods, rising educators will develop methods to impact student equity based on culturally competent models as well as growth mindset methods. The students will be embedded in classrooms in observing and active teaching roles (any of the 5 co-teaching models). They will experience a variety of settings in order to reflect on their developing understanding and skills across the K-12 spectrum.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Know, practice and reflect on concepts relating to the personal characteristics of education professionals.
    a. Personal Expectations: professionalism, becoming a change agent, high personal standards, responsible use of social media and online platforms, accountable talk including meaningful praise. Students review these topics as expectations for entering classrooms.
    b. Improvement: growth mindset, reflective habits of mind.
    c. Critical Thinking: responsive planning, critical thinking: my experiences, how do I know if I learned something? media literacy, resource literacy, investigating sources.
2. Know, practice and reflect on how teachers understand their students.
    a. Students know the cognitive development: ages and stages, experiential learning, constructivism.
    b. Students understand factors that impact relationships with students and practice planning for, developing and reflecting on how they relate to students by considering cultural competence, expectations for students, building mutual respect, establishing boundaries, embracing diversity, asset-based approach, and celebrating success.
    c. Students know about different learning needs, understand that students' experiences are unique and practice planning for, responding to and reflecting on how to meet the needs of diverse students. (Special Education 101, differentiation, types of disabilities in IDEA (Individuals with Disabilities Education Act), supporting students facing trauma)
    d. Engaging with Students: motivation, challenging all students and meeting all students' needs, brain-based learning, personalized learning, and deeper learning.
3. Know different classroom managements and instructional strategies, understand the purpose and results of a strategy, and practice selecting, implementing and reflecting on a variety of classroom strategies and how these strategies meet the needs of diverse learners.
    a. Classroom Management: student engagement, culturally relevant teaching, classroom norms and routines, inclusive learning environments, anti-bullying strategies, de-escalating and managing conflict.

b. High Leverage Practices: eliciting and interpreting individual students' thinking, coordinating and adjusting instruction during a lesson, interpreting the results of student work, including routine assignments, quizzes, tests, projects, and standardized assessments, analyzing instruction for the purpose of improving it, setting short- and long-term learning goals for students, checking student understanding during and at the conclusion of lessons, selecting and designing formal assessments of student learning.

The Learning Community 331030

In this course, students develop an understanding of the various responsibilities and systems involved in the K-12 educational system. Specifically, students will acquire the knowledge of education through the perspective of classroom, school, district, state, and federal roles. In clinical experiences, students are embedded in observational and small group or individual teaching settings. They engage with students, schools, and stakeholders across the community to better understand how the community functions as a system, noting how elements within the system relate and interact and the impact of students.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Know, practice and reflect on concepts relating to the personal characteristics of education professionals.
    a. Self-Awareness: my identity, understanding bias, understanding equity, my values, StrengthsFinder, empathy, teacher impact, teacher persona.
    a. Personal Expectations: professionalism, becoming a change agent.
    b. Leadership: common characteristics of successful leaders, credibility, unpack concept of credibility and trustworthiness, habits of effective speakers.
    c. Connecting with Students: cultural competence, expectations for students, building mutual respect, establishing boundaries.
2. Know the language of the work of teaching, understand the cycle of planning, implementing evaluating and reflecting on a lesson, and practice planning, implementing, reflecting on and revising classroom practice.
    a. Planning: Standards 101, Curriculum 101, understanding by design.
    b. Assessing: Assessment 101formative assessment summative assessment.
3. Know the structure of communities within and beyond the school, understand how these communities form and interconnected system of systems, and practice connecting and reflecting on these communities.
    a. Partners: understanding the roles of stakeholders, building relationships with families and caregivers, talking about a student with families and caregivers, mapping resources available to support students.
    b. Colleagues: collaboration with colleagues, working with administrators, extracurricular activities.
    c. Local Community: civic engagement, community organizations, supporting social justice at home, researching your community, local/regional culture, identifying equity.
4. Know the structures that govern a school and school systems, understand the role of the professional educator within these systems, and practice developing a personal professional identify and career path.
    a. Understanding the School System: purpose of school, school system: federal vs. state vs. local, local governance, policy making, school funding including Title I

of ESEA (Elementary and Secondary Education Act), district and school budgets, accountability systems, salary schedules and trends, types of schools.

b. Planning a Path: career pathways, roles, and opportunities, being a professional, unpacking the Educators Rising standards report.
c. Context for Great Teaching: profiles of effective educators, edTPA101, National Board 101: five core propositions, mythbusting: superhero teachers, the history of teaching, unions, collective bargaining, due process, professional associations and organizations for educators.

The Professional Educator 331032

In this course, students will develop an understanding of how educators advance their profession within the classroom. Specifically, students will gain both the knowledge and skills to plan, deliver, and reflect on the process of teaching and learning. In clinical experiences, students are deeply embedded in classroom settings, actively practicing the skills they are studying and reflecting on the results to deepen their understanding. The extended time in the classroom provides an opportunity to study at length a particular group of students and the discipline.

Prerequisites: The Learning Community 331030 **AND** The Learner-Centered Classroom 331031

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Know, practice and reflect on concepts relating to the personal characteristics of education professionals, developing a personal professional identity.
    a. Self-Awareness: my identity, understanding bias, understanding equity.
    b. Personal Expectations: professionalism, becoming a change agent, high personal standards, responsible use of social media and online platforms, accountable talk including meaningful praise. Students have studied the topic above in previous courses, but will engage further in these as they enter classrooms as Rising Educators.
    c. Improvement: growth mindset, reflective habits of mind, how to get better, intention and purpose, building a professional network for support, seeking feedback and mentoring.
    d. Critical thinking: responsive planning, resource literacy, investigating sources.
2. Know different classroom managements and instructional strategies, understand the purpose and results of a strategy, and practice selecting, implementing and reflecting on a variety of classroom strategies.
    a. Introducing Teaching: developing pedagogical knowledge, the importance of content knowledge.
    b. Classroom Management: student engagement, culturally relevant teaching, classroom norms and routines, inclusive learning environment, anti-bullying strategies, de-escalating and managing conflict.
    c. High Leverage Practices: leading a group discussion, explaining and modeling content, practices and strategies, eliciting and interpreting individual students' thinking, diagnosing particular common patterns of student thinking and development in a subject-matter domain, implementing norms and routines for classroom discourse and work, specifying and reinforcing productive student behavior, setting up and managing small group work, designing single lessons and sequences of lessons, providing oral and written feedback to students, analyzing instruction for the purpose of improving it.

3. Know the expectations of being a professional (code of ethics, unpacking the Educators Rising standards report and professional skills and terminology), understand how teachers use research to stay current and practice professional behavior and growth.

Principles of Career and Technical Education 331034

This course is designed to provide a general overview of career and technical education including program areas, components, philosophy, and current trends and issues. Students will examine a variety of topics including: history of Career and Technical Education (CTE), work-based learning, career and technical student organizations, advisory councils, professional organizations as well as the influence of legislation on Career and Technical Education (CTE).

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Understand career and technical education, including its essential characteristics, components, and effect in a multicultural society.
2. Develop a basic philosophy of Career and Technical Education (CTE).
3. Explain the historical foundations of CTE (Career and Technical Education), its evolution over time, its mission, and strategies.
4. Understand the development of career and technical education and the federal legislation effecting career and technical education.
5. Understand the administration and financing of career and technical education.
6. Explore the nature and purpose of the program areas in CTE (Career and Technical Education).
7. Analyze career opportunities in each of the program areas.
8. Understand equity, career guidance, and special needs (including exceptional children) programs and their interaction with CTE (Career and Technical Education).
9. Understand the integration of academic and career and technical education.
10. Determine the role student organizations play as an integral part of CTE (Career and Technical Education).
11. Analyze organizational structures and their components including bylaws, officers, committees, and program of work.
12. Explain the procedures of parliamentary law using Robert's Rules of Order.
13. Demonstrate the use of proper parliamentary procedure skills.
14. Understand the role and functions of CTE (Career and Technical Education) advisory councils.
15. Assess the importance of professional organizations available to career and technical education teachers and their functions in influencing policy, legislation, and practices in CTE (Career and Technical Education).
16. Explore the role that business and industry plays in CTE (Career and Technical Education) programs.
17. Investigate work-based learning opportunities.
18. Identify appropriate industry certifications for secondary students.
19. Demonstrate appropriate professional etiquette.
20. Understand the importance of an ethical climate in the workplace.
21. Develop a tool to increase time management, planning skills, and organization in the workplace.

22. Justify the value of diversity in the workplace (cultural, socio-economic, ethnicity, disability, gender).
23. Determine impact of social, economic, cultural, and technological forces on employee development and performance through evaluation tools.
24. Practice confidentiality and other workplace policies in work-based learning placements.
25. Integrate new technology trends in the workplace utilizing web 2.0 tools, new software programs and hardware.
26. Apply math, science, communication skills, problem solving, and decision making within technical content.
27. Utilize activities of the CTSOs (Career and Technical Student Organizations) as an integral component of course content and leadership development.

ENGINEERING TECHNOLOGY EDUCATION

ENERGY CAREER PATHWAYS

Energy Management CIP 15.0503.02

Madisonville Community College's Energy Management program, with its national certifications embedded within the curriculum, prepares students for a variety of employment opportunities. Entry level positions in the energy production industry include renewable energy sales, LEED consultant, alternative energy consultants, and residential audits. Energy Management graduates can also find employment in the growing fields of energy audit, energy consulting, and facilities management. Employment opportunities are expected to be the greatest in metropolitan areas.

Access to this curriculum requires a partnership with a postsecondary institution to enable successful attainment of the industry certification. Updated course content and information can be obtained via the Madisonville Community College Energy Management website.

BEST PRACTICE COURSES

Complete (4) four credits:

- 210245 Energy I: Energy Industry Basics
- 210246 Energy II: Power Generation and Distribution
- 210247 Energy III: Emerging Technologies in Energy
- 210248 Energy IV: Sustainability Management

Sustainability and Energy Application Technician CIP 15.0503.01

This pathway prepares students to apply engineering principles and technical skills in support of engineers and other professionals engaged in developing energy-efficient systems or monitoring energy use. The content includes activities to develop knowledge and skill in, but is not limited to the study of power systems and the kinds and sources of energy, repair, service, and maintenance of small internal-combustion engines used on portable power equipment such as generators, electrical motors, generators, and wind turbines. The content and activities will also include the study of safety, and leadership skills.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210341 Foundations of Energy
- 210242 Introduction to Alternative Energy

Choose (2) two credits from the following:

- 210243 Alternative Energy
- 210244 Global Energy Issues
- 210142 Power and Energy Equipment Technology
- 210330 Engineering Co-op **OR** 210331 Engineering Internship

ENERGY COURSES

Alternative Energy 210243

This course provides students with the foundation in content and skills associated with various energy sources, and electrical power generation, transmission, and distribution. Students will develop competencies in the area of energy history and the global impact of renewable and non-renewable resources; career opportunities; environmental principles, working with AC/DC electrical circuits, and transfer of various energy forms to produce DC current. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisite: Introduction to Alternative Energy 210242

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Prepare labs to demonstrate the understanding of AC/DC electrical circuits.
3. Demonstrate knowledge viability of biomass and biofuel.
4. Understand and utilize communications skills to plan for and accomplish objectives/goals.
5. Understand that chemical bonds require energy to form, and release that energy when broken.
6. Evaluate the pros and cons of biodiesel, and develop a persuasive argument for the use of biodiesel as an alternative to fossil fuels.
7. Identify and explore the impacts (intended and unintended) of technological advancements in Agriculture and related biotechnologies, Energy and Power, and Transportation Technologies.
8. Explore the ecological and economic impacts of unethical decisions (case studies and scenarios of regulation violations, whistle-blowing, kick-backs, pay-offs, labor disputes, illegal dumping, and straight-pipe sewage).
9. Design and fabricate evaluation tools (instruments, models, simulations, software) that assess the impact of products and systems through information collection and data synthesis.
10. Explain the properties and atomic structure of radioactive elements.
11. Describe how electricity can be generated from radioactive sources.
12. Demonstrate an understanding of careers in Energy Generations and Transmission/Distribution.

Energy I: Energy Industry Basics 210245

Investigates competencies required for employment by various industries that manufacture energy sources. Addresses the competencies identified by the Center for Energy Workforce Development (CEWD) organization that are needed for energy industries. Combined with Energy II and Energy III qualifies students to take the CEWD Energy Industry Fundamentals (EIF) certification exam. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Access to this curriculum requires a partnership with a postsecondary institution to enable successful attainment of the industry certification. Updated course content and information can be obtained via the Madisonville Community College Energy Management website.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Energy II: Power Generation and Distribution 210246

Introduces students to methods of power production, power distribution, and physics principles that are associated with both. Addresses the competencies identified by the Center for Energy Workforce Development (CEWD) organization that are needed for energy industries. Combined with Energy I and Energy III qualifies students to take the CEWD Energy Industry Fundamentals (EIF) certification exam. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Access to this curriculum requires a partnership with a postsecondary institution to enable successful attainment of the industry certification. Updated course content and information can be obtained via the Madisonville Community College Energy Management website.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Energy III: Emerging Technologies in Energy 210247

Introduces students to emerging technologies and careers in the energy industry. It is the third of three modules that addresses the competencies identified by the Center for Energy Workforce Development (CEWD) organization that are needed for energy industries. Combined with Energy I and Energy II qualifies students to take the CEWD Energy Industry Fundamentals (EIF) certification exam. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Access to this curriculum requires a partnership with a postsecondary institution to enable successful attainment of the industry certification. Updated course content and information can be obtained via the Madisonville Community College Energy Management website.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Energy IV: Sustainability Management 210248

Examines the management of corporations as it relates to sustainability. Includes an overview of energy technology, energy resources, and emerging future energy technologies coupled with social and environmentally related legislation and its effect on corporations' triple bottom line (people, profit, and planet). **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Access to this curriculum requires a partnership with a postsecondary institution to enable successful attainment of the industry certification. Updated course content and information can be obtained via the Madisonville Community College Energy Management website.

Recommended Grade Level: 12

Recommended Credit: 2

Engineering Co-op 210330

Cooperation Education is a paid education program consisting of in-school instruction combined with the program related on-the-job work experience in a business or industrial establishment. These are planned experiences supervised by the school and the employer to ensure that each phase contributes to the student's Individual Learning Plan (ILP). Refer to the KDE Work-Based learning Manual for further specifications. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Engineering Internship 210331

Internship for CTE courses provides supervised work-site experience for high school students associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Foundations of Energy 210341

The course provides an overview of renewable and nonrenewable energy resources reflecting how energy impacts the environment and economy from regional, state, national and global perspectives. Extensive hands-on laboratory activities are vital components in this course. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 9 - 11

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Develop competencies and skills in the areas of energy.
3. Engage in meaningful hands-on minds-on conceptual based activities in the areas of energy.
4. Develop competencies in the safe and efficient use of the tools, machines, materials and processes of energy technology.
5. Demonstrate employability and social skills relative to careers in energy industry.
6. Understand electric power generation, transmission and distribution.
7. Use computer-based skills related to concepts of energy in the various technologies.
8. Demonstrate knowledge and skills in blueprint reading in energy technology.
9. Demonstrate and develop fundamental skills and knowledge of tools in the energy industry.
10. Apply basic electricity concepts and knowledge as it applies to energy technologies.
11. Describe similarities and differences between renewable and nonrenewable sources of energy.
12. Develop core competencies in the area of safety.
13. Identify ways to conserve energy.
14. Compare advantages and disadvantages in the use of the various energy sources.
15. Assess the impact of the various energy sources on the economy in Kentucky.
16. Differentiate between the terms energy and electricity.
17. Describe the difference in potential and kinetic energy.
18. Analyze how supply and demand impacts Kentucky's economy in relation to energy.
19. Investigate the role of technology in the future development of energy usage.
20. Map the major sources of energy used in Kentucky.
21. Analyze the impact energy has on the environment.

Global Energy Issues 210244

The course critically examines issues associated with the technical, economic, societal, environmental, and geopolitical aspects of energy and sustainability. Students will develop competencies in the area of energy history and the global impact of renewable and non-renewable resources; career opportunities; environmental principles. The course is taught through lectures, discussions, hands on activities, field trips and invited speakers. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Describe basic concepts of energy and power, including types of energy, conversion of energy, and conservation of energy and energy analysis.
3. Understand and apply sustainability in various aspects of the world around them including the campus, local, and national and global initiatives.
4. Explore, review and discuss the current mix of energy sources in use around the world, including coal, natural gas, oil, nuclear, solar, wind, geothermal, hydro, and biomass.
5. Prepare a presentation on the basics of electric power, including emerging issues of smart grid transmission and distribution.
6. Understand and discuss the basic environmental issues with energy generation and use, the basic policy issues of power and energy, including environmental regulation, pricing, and development.
7. Explain the basic economic aspects of power and energy, including energy markets.
8. Describe the relationships between energy use and economic activities, standard of living, and cultures.
9. Investigate and interpret the basic geopolitical issues of power, including national security and economic security. By using critical and creative inquiry, students will demonstrate a grasp of the global inequalities and diversities that exist with respect to energy across the world.

Introduction to Alternative Energy 210242

This course provides students with the foundation in content and skills associated with various energy sources, and electrical power generation, transmission, and distribution. Students will develop competencies in the area of energy history and the global impact of renewable and non-renewable resources; career opportunities; environmental principles, working with AC/DC electrical circuits, and transfer of various energy forms to produce DC current. Laboratory-based activities are an integral part of the course that includes safe use and application of appropriate technology, scientific testing and observation equipment. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 10 - 11

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Summarize the value of alternative energy.
3. Describe the importance of professional ethics and legal responsibilities with regards to alternative energy opportunities.
4. Explain the significance of various alternative sources of energy.
5. Demonstrate personal money-management concepts, procedures, and strategies for alternative energy use.
6. Identify the pioneers in the field of developing energy alternatives.
7. Identify how the characteristics of goal-directed research impact technology.
8. Describe factors that motivate technological development such as profit, function, form, and quality.
9. Differentiate between petroleum diesel and biodiesel and between the operation of a gasoline engine and a diesel engine.
10. Trace the flow of energy through an ecosystem.
11. Know the basic structure and characteristics of atoms, including how they bond.
12. Analyze current and emerging issues (such as ethical, social, legal, environment, political, and privacy) related to technology to identify appropriate and inappropriate applications of technology.
13. Describe how electricity can be generated from radioactive sources.
14. Design, construct, and assess alternative solutions to technological problems that minimize/alleviate negative impacts.
15. Understand and utilize communications skills to plan for and accomplish objectives/goals.

Power and Energy Equipment Technology 210142

Power and Energy Equipment is used every day in many different ways. To become a more environmentally friendly society, students will have a basic understanding of the various types of energy equipment and how energy is obtained or generated. Everyone should know what energy sources are available that do not pollute the environment and how this energy can be converted into a useful power supply. This course provides students with foundation in content and skills associated with various energy sources, and electrical power generation, working with AC/DC electrical circuits, and transfer of various energy forms to produce DC current. Laboratory-based activities are an integral part of the course that includes safe use and application of appropriate technology, scientific testing and observation equipment. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Describe sources of energy.
3. Demonstrate an understanding of the cultural, social, economic, and political effects of power and energy technology.
4. Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
5. Demonstrate the abilities to use and maintain technological products and systems.
6. Demonstrate an understanding of and be able to select and use energy and power technologies.
7. Demonstrate safe and appropriate use of tools, machines, and materials in power and energy technology.
8. Demonstrate technical knowledge and skills related to power and energy systems.
9. Demonstrate technical knowledge and skills about steam power technology.
10. Demonstrate technical knowledge and skills about hydraulic and pneumatic power technology.
11. Demonstrate technical knowledge and skills about electric power technology.
12. Demonstrate technical knowledge and skills about solar cells and fuel cells.
13. Measure and report the power and efficiency of power producing systems.
14. Conduct a research and experimentation project on an energy and power system.
15. Demonstrate an understanding of career opportunities and requirements in the field of power and energy technology.

ENGINEERING CAREER PATHWAYS

Aerospace Engineering CIP 14.0201.01

This pathway prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of aircraft, space vehicles, and their systems; applied research on flight characteristics; and the development of systems and procedures for the launching, guidance, and control of air and space vehicles. Aerospace engineers design primarily aircraft, spacecraft, satellites, and missiles. In addition, they test prototypes to make sure that they function according to design.

BEST PRACTICE COURSES

Choose (1-2) one - two credits from the following:

- 210226 Introduction to Aerospace
- 210235 Space Systems Engineering I
- 210221 Engineering I
- 210222 Engineering II

Choose (1-2) one - two credits from the following:

- 210229 Aerospace Engineering
- 210236 Space Systems Engineering II

Choose (1-2) one - two credits from the following:

- 210232 Electrical/Electronics Engineering
- 210117 Advanced Design Applications
- 210251 Unmanned Aircraft Systems
- 210110 Engineering Capstone
- 210330 Engineering Co-op **OR** 210331 Engineering Internship
- 331034 Principles of Career and Technical Education
- 110701 AP Computer Science A **OR** 110711 AP Computer Science Principles

Automation Engineering CIP 15.0613.00

This pathway prepares individuals to apply scientific and mathematical principles to the design, development, and implementation of automated and robotic systems. The pathway includes instruction in materials science and engineering, manufacturing processes, process engineering, assembly and product engineering, robotic systems design, and manufacturing competitiveness. Automation Engineers plan the practices of manufacturing by researching and developing tools, processes, machines, and equipment to integrate the facilities and systems for producing quality products with the optimal expenditure of capital.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 210221 Engineering I
- 210222 Engineering II

Choose (2-3) two – three credits from the following:

- 210135 Industrial Engineering
- 210225 Manufacturing Engineering
- 210230 Mechatronics Engineering
- 210238 Robotics Engineering
- 210239 Robotics Automation and Design
- 210117 Advanced Design Applications
- 210251 Unmanned Aircraft Systems
- 210110 Engineering Capstone
- 210330 Engineering Co-op **OR** 210331 Engineering Internship
- 331034 Principles of Career and Technical Education
- 110701 AP Computer Science A **OR** 110711 AP Computer Science Principles

Civil Engineering CIP 14.0801.00

This pathway generally prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of structural, load-bearing, material moving, transportation, water resource, and material control systems; and environmental safety measures. Civil engineers design, build, supervise, operate, and maintain construction projects and systems in the public and private sector, including roads, buildings, airports, tunnels, dams, bridges, and systems for water supply and sewage treatment.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 210221 Engineering I
- 210222 Engineering II

Complete (1) one credit:

- 210223 Civil Engineering

Choose (1-2) one – two credits from the following:

- 210117 Advanced Design Applications
- 210251 Unmanned Aircraft Systems
- 210250 Environmental Engineering
- 210110 Engineering Capstone
- 210330 Engineering Co-op **OR** 210331 Engineering Internship
- 331034 Principles of Career and Technical Education
- 110701 AP Computer Science A **OR** 110711 AP Computer Science Principles

Electrical/Electronics Engineering CIP 14.1001.00

This pathway prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of electrical, electronic related systems and their components. Electrical engineers design, develop, test, and supervise the manufacturing of electrical equipment, such as electric motors, electrical controls, instrumentation, HMI Interfaces, PLCs, industrial controls, and power generation equipment. Electrical engineers design, develop, test, and supervise the manufacturing of electrical equipment, such as electric motors, radar and navigation systems, communications systems, and power generation equipment. Electronics engineers design and develop electronic equipment, including broadcast and communications systems, such as portable music players and Global Positioning System (GPS) devices.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 210221 Engineering I
- 210222 Engineering II

Complete (1) one credit:

- 210232 Electrical/Electronics Engineering

Choose (1-2) one – two credits from the following:

- 210117 Advanced Design Applications
- 210251 Unmanned Aircraft Systems
- 210110 Engineering Capstone
- 210330 Engineering Co-op **OR** 210331 Engineering Internship
- 331034 Principles of Career and Technical Education
- 110701 AP Computer Science A **OR** 110711 AP Computer Science Principles

Engineering Design CIP 15.1302.00

Designed for students interested in the various disciplines of engineering. The sequence of courses will provide students with the opportunity to develop critical thinking skills and understanding of engineering concepts. Students then apply these skills in conjunction with the multi-step engineering design process to solve real-world problems. Includes instruction in two-dimensional and/or three-dimensional engineering design software, solid modeling, and engineering animation to solve real-world problems.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 210221 Engineering I
- 210222 Engineering II

Choose (2-3) two – three credits from the following:

- 210138 Technical Design I
- 210108 Technical Design II
- 210140 Architectural Design
- 210141 Building Construction Technologies
- 210117 Advanced Design Applications
- 210251 Unmanned Aircraft Systems
- 210250 Environmental Engineering
- 210110 Engineering Capstone
- 210330 Engineering Co-op **OR** 210331 Engineering Internship
- 331034 Principles of Career and Technical Education
- 110701 AP Computer Science A **OR** 110711 AP Computer Science Principles

Mechanical Engineering CIP 14.3501.00

This pathway prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of physical systems used in manufacturing and end-product systems for specific uses including machine tools, jigs and other manufacturing equipment; stationary power units and appliances; engines; self-propelled vehicles; housings and containers; hydraulic and electric systems for controlling movement; and the integration of computers and remote control with operating systems. Mechanical Engineers design, develop, build, and test mechanical and thermal sensors and devices including tools, engines, and machines.

BEST PRACTICE COURSES

Choose (1-2) one – two credits from the following:

- 210221 Engineering I
- 210222 Engineering II

Choose (1-2) one – two credits from the following:

- 210238 Robotics Engineering
- 210118 Mechanical Engineering

Choose (1-2) one – two credits from the following:

- 210232 Electrical/Electronic Engineering
- 210117 Advanced Design Applications
- 210251 Unmanned Aircraft Systems
- 210110 Engineering Capstone
- 210330 Engineering Co-op **OR** 210331 Engineering Internship
- 331034 Principles of Career and Technical Education
- 110701 AP Computer Science A **OR** 110711 AP Computer Science Principles

CTE-ENGINEERING HYBRID CAREER PATHWAYS

Automotive Engineering CIP 15.0803.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. This pathway prepares individuals to apply engineering principles and technical skills in support of engineers and other professionals engaged in developing, manufacturing, and testing self-propelled ground vehicles and their systems. It includes instruction in vehicular systems technology, design and development testing, prototype and operational testing, inspection and maintenance procedures, instrument calibration, test equipment operation and maintenance, and report preparation.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210221 Engineering I
- 210232 Electrical/Electronics Engineering

Complete (4) four credits:

- 470507 Automotive Maintenance and Light Repair Section A
- 470509 Automotive Maintenance and Light Repair Section B
- 470511 Automotive Maintenance and Light Repair Section C
- 470513 Automotive Maintenance and Light Repair Section D

Computerized Manufacturing and Machining (CMM) Engineering CIP 48.0510.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. CMM Engineers design, develop and run programs which direct machines to cut and shape metal or plastic for such things as airplanes, automobiles and other industrial machines. CMM Engineers use blueprints and three-dimensional computer designs to create the programs which result in precisely cut products.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210118 Mechanical Engineering
- 210135 Industrial Engineering
- 210225 Manufacturing Engineering

Complete (3) three credits:

- 470913 Fundamentals of Machine Tools-A
- 470914 Fundamentals of Machine Tools-B
- 470915 Manual Programming

Construction Architectural Engineering CIP 15.0101.02

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. This pathway prepares individuals to apply engineering principles and technical skills in support of architects, engineers and planners engaged in designing and developing buildings, urban complexes, and related systems. Includes instruction in design testing procedures, building site analysis, model building and computer graphics, structural systems testing, analysis of prototype mechanical and interior systems, report preparation, basic construction and structural design, architectural rendering, computer-aided drafting (CAD), layout and designs, architectural blueprint interpretation, building materials, and basic structural wiring diagramming.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210223 Civil Engineering
- 210140 Architectural Design
- 210141 Building Construction Technologies

Complete (3) three credits:

- 460201 Introduction to Construction Technology
- 460213 Ceiling and Roof Framing
- 460212 Floor and Wall Framing

Design Engineering CIP 15.1304.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Design Engineers have a working knowledge of mechanical parts as well as computer-aided design (CAD) software such as AutoCAD, Autodesk Inventor, or Solidworks. Mechanical designers begin a project by meeting with project manager, engineers, and clients to understand the needs and requirements for a new product or mechanical system. For example, designers working on a project to create an automobile engine may consult engineers regarding which structural materials to use or clients regarding engine efficiency requirements. Once materials and specifications have been determined, designers begin using CAD (computer-aided design) software to plan and develop models.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210222 Engineering II
- 210138 Technical Design I
- 210108 Technical Design II

Choose (3) three credits from the following:

- 480110 Introduction to Computer-Aided Drafting
- 480113 Engineering Graphics
- 480135 Mechanical Design
- 480136 Parametric Modeling

Electrical Construction Engineering CIP 15.0303.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. This pathway prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair electric apparatus and systems such as residential, commercial, and industrial electric-power wiring; and DC and AC motors, controls, and electrical distribution panels. It includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210221 Engineering I
- 210232 Electrical/Electronics Engineering

Complete (3) three credits:

- 460316 Circuits I (1.5 credits)
- 460319 Circuits II (1.5 credits)

Fabrication Engineering CIP 14.1901.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Fabrication Engineers design parts to engineering specifications that are required for the development of metal parts and interior metal structures. Fabrication Engineers work with Sheet Metal Technicians in the development of complex geometrical parts. The Fabrication Engineer provides direct support to the manufacturing industry in the areas of design, fabrication, modification and development of metal assemblies, components and sub-assemblies.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210221 Engineering I
- 210222 Engineering II

Choose (3) three credits from the following:

- 480816 Metal Trade Information and Metals
- 480813 Parallel Line Layout
- 480817 Sheet Metal 1-A
- 480818 Sheet Metal 1-B

Industrial Maintenance Engineering CIP 14.4101.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Electrical Engineers apply electrical theory and related knowledge to diagnose and modify developmental or operational electrical machinery, electrical control equipment, and circuitry in industrial or commercial plants and laboratories. Electrical Engineers experiment with motor-control devices, switch panels, transformers, generator windings, solenoids, and other electrical equipment and components according to engineering data and knowledge of electrical principles.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210232 Electrical/Electronics Engineering
- 210230 Mechatronics Engineering
- 210225 Manufacturing Engineering
- 210135 Industrial Engineering

Complete (3) three credits:

- 470348 Industrial Maintenance Electrical Motor Controls
- 470322 Industrial Maintenance Electrical Principles
- 470330 Industrial Maintenance of PLC's

Structural Engineering CIP 14.0803.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. This pathway prepares individuals to apply engineering principles and technical skills in support of architects, engineers and planners engaged in designing and developing buildings, urban complexes, and related systems. It includes instruction in design testing procedures, building site analysis, model building and computer graphics, structural systems testing, analysis of prototype mechanical and interior systems, report preparation, basic construction and structural design, architectural rendering, architectural-aided drafting (CAD), layout and designs, architectural blueprint interpretation, building materials, and basic structural wiring diagramming.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210223 Civil Engineering
- 210141 Building Construction Technologies

Complete (3) three credits:

- 460201 Introduction to Construction Technology
- 460218 Construction Forms
- 460214 Site Layout and Foundations

Welding Engineer CIP 15.0614.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Welding Engineers design and develop metal components for products for the pipeline, automotive, boiler making, ship building, aircraft and mobile home industry. Welding Engineers must have knowledge of cutting processes and gas metal arc welding procedures for efficient development of these industrial processes.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210222 Engineering II
- 210138 Technical Design I
- 210108 Technical Design II

Choose (3) three credits from the following:

- 480505 Blueprint Reading for Welding
- 480501 Cutting Processes
- 480522 Gas Metal Arc Welding
- 480521 Shielded Metal Arc Welding (SMAW)

Wood Manufacturing Engineering CIP 03.0509.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Wood Manufacturing Engineers design and create interior cabinets and wood products for homes and businesses. Wood Manufacturing Engineers consult with clients and cabinetmakers for cutting, shaping wood, preparing surfaces and forming a completed product.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210221 Engineering I
- 210225 Manufacturing Engineering

Choose (3) three credits from the following:

- 480731 Cabinet Making Technology
- 480725 CAD for Wood Technology
- 480721 Furniture Technology
- 480716 Lumber Grading and Drying
- 480740 Wood Product Manufacturing
- 480733 Advanced Wood Processing

ENGINEERING COURSES

Advanced Design Applications 210117

This course focuses on how engineers and technicians apply their creativity, resourcefulness, mathematical, technical and scientific knowledge and skills to solve authentic design problems. This course is a dual credit course offered by Eastern Kentucky University (EKU). More information about this partnership can be found on EKU's Dual Credit webpage. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Explain the different scales and be able to convert different measurements.
2. Develop a design and create a scale drawing and a scale three-dimensional model of that design.
3. Employ common techniques for residential housing design.
4. Sketch elementary construction details such as foundations, framing, roofing, and sheathing.
5. Identify physical characteristics that promote or hinder interaction among residents of a neighborhood.
6. Design appropriate features for a new or existing neighborhood to encourage community interaction.
7. Demonstrate appropriate residential building techniques.
8. Identify the key ideas of green building.
9. Describe the process and requirements of LEED certification.
10. Design/model buildings that utilize optimum value engineering (OVE).
11. Explain the use of survey equipment and purpose of surveying equipment.
12. Explain how to read a leveling rod and how to take readings.
13. Understand key surveying terminology.
14. Explain how to determine elevations by surveying/leveling.
15. Explain common mistakes made when surveying/leveling.
16. To understand that construction technology involves the design of structures to meet various requirements.
17. Students will design and construct an architectural model.
18. Refine a design by using scale drawings and models.
19. Evaluate the design solution using conceptual, physical, and mathematical models at various intervals on the design process in order to check for proper design and to note where improvements are needed.
20. Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.

21. Explain the term "spinoff" and provide an example.
22. Explain the function of a tradeoff and provide an example.
23. Identify and explain how external factors affect the design of a product before it is manufactured.
24. Identify and change a set of characteristics within a design as they pertain to a set of design principles (for example, function, efficiency, aesthetics, ergonomics, and anthropometrics) and apply those characteristics to the development of a product and a system.
25. Use tables, charts, and graphs in making arguments and claims in oral, written, and visual presentations.
26. Make decisions about units and scales that are appropriate for problem situations.
27. Classify manufacturing systems as customized production, batch production, and continuous production.
28. Explain the essential aspects of mass customization practices.
29. Explain how physical sketch models, 2D sketches, and digital models can be used as visualization tools for design ideation.
30. Explain how design changes developed requires revisions to critical data such as costs, materials, and component requirements.
31. Explain how quality control is affected by input and output factors when applied to a manufacturing process.
32. Identify how people, materials, tools, and training affect product quality.
33. Produce multiple products that are controlled for quality.
34. Create functional fixtures and jigs for creating their product.
35. Develop a program to logically control a set of inputs to achieve a desired output.
36. Generate a viable solution to a technological problem using a design model (the design loop).
37. Utilize appropriate design principles while developing an automated manufacturing machine.
38. Explain how sensors work and how they are used in manufacturing to control technological systems and devices.
39. Describe how a microprocessor is used to control devices and systems and to provide information to humans.
40. Understand how relays work.
41. Create a working relay.
42. Construct a circuit using a commercial relay.
43. Classify materials as natural, synthetic, or mixed based on the mechanical, thermal, and electrical properties of the material.
44. Examine that materials have different qualities and may be classified as natural, synthetic, or mixed.
45. Define the mechanical processes that change the form of materials through the processes of separating, forming, combining, and conditioning them.
46. Explore the manufacturing process of designing, development, making, and servicing products and systems.
47. Explain the functionality of a manufacturing enterprise.
48. Collaboratively work together to form a manufacturing company and produce a product.

Aerospace Engineering 210229

This course that introduce the principles of flight and aerodynamics and lay the ground work for applying engineering principles. This aerodynamics course focuses on the study of the flow of air about an airfoil. Students will interact with technology which simulates various airfoil designs and determines airflow around various shapes. This course also introduces aerospace engineering as an interdisciplinary profession, including other areas of engineering. Students will learn the engineering design process, which includes defining the need or problem, researching related principles and solutions, creating designs, testing prototypes, evaluating, and redesigning. Relationships between aircraft performance and other aspects of engineering (such as designing runways) will also be explored. Students will learn to analyze and interpret data to improve performance. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Identify the various vehicles used for human flight.
3. Identify and explain the forces acting on an airplane, how the main components of the airplane control these forces, and how changes to the design of the airplane affect performance.
4. Conduct model analysis and verification.
5. Create model documentation including working drawings, dimensioning, and annotations.
6. Use modeling and spreadsheet software to design and analyze data from various airfoil shapes.
7. Identify the various instruments used to measure the lift and drag forces generated by an airfoil in a wind tunnel.
8. Communicate test results through a technical report and a presentation to the class.
9. Develop knowledge about the evolving technology of aerial navigation including VFR, IFR, VOR, Wide Areas Augmentation System (WAAS), Local Area Augmentation Systems (L.A.A.S.), and Synthetic Vision systems to the Global Positioning System.
10. Define terms and concepts of the design, flight, and forces on a rocket and be able to explain how they interact.
11. Use trigonometry to calculate performance of rockets.
12. Explain basic orbit theory satellite motion and orbit parameters.
13. Work cooperatively in a team to design and conduct experiments related to positive G-force.

14. Analyze various materials to determine their appropriate application in space craft.
15. Design a computer-driven system for a robot to perform a series of predetermined functions without having anything impede its progress while successfully delivering a payload to a predetermined location.
16. Design, build, and test an intelligent vehicle that will meet criteria determined by students.

Architectural Design 210140

This course is for students who wish to broaden their basic skills in the field of residential architectural drafting and surveying. Covers procedures used in developing complete set of residential plans, history of surveying, mathematics, measurement and computations, and the proper use of basic drafting and surveying instruments, equipment and software. Students will develop projects in accordance to drafting and building code requirements. Projects will emphasize the importance of communication and organization as they participate in the roles of civil engineers, architects, land developments, surveyors, and/or general contractors in residential planning and construction. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
3. Employ computer operations applications to access, create, manage, integrate, and store information.
4. Prepare architectural drawings, such as floor plans, site plans, elevations, and prepare roof plans.
5. Demonstrate understanding of civil drawings.
6. Develop architectural models.
7. Set up surveying equipment and apply its use to real-world application.
8. Use oral and written communication skills in creating, expressing and interpreting information and ideas.

Building Construction Technologies 210141

Students explore architectural design foundations and increase understanding of working drawings, construction techniques, and codes regulating building design. They learn the design process and apply the elements and principles of design to architectural projects. Through producing models and illustrations of all aspects of a building, students create architectural design solutions using CAD (computer aided design). Students design and build scale or full-size structures and work with projects that help them understand the jobs of architects, carpenters, electricians, plumbers, surveyors, contractors, masons, design engineers, and a variety of other construction careers. They also explore aspects of the construction industry. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Use basic drafting tools and techniques and develop accurate measurement techniques to communicate drafting ideas.
3. Demonstrate various drawing scales used in technical drawing.
4. Through the use of basic drafting equipment students will produce geometric shapes and figures that describe various objects, structures, and designs.
5. Demonstrate knowledge and skill with illustration technique and working drawings.
6. Demonstrate basic mathematic concepts in basic arithmetic, algebra, geometry, and trigonometric to solve problems and apply multiple discipline calculations.
7. Describe basic house design concepts.
8. Summarize modern innovations and techniques used in new construction
9. Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
10. Describe the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.
11. Define the roles and responsibilities of the general contractor, specialty contractor, construction management and design build firms.
12. Describe the process of applying for building permits and variances.
13. Select and safely use hand and power tools and describe their operations.
14. Demonstrate carpentry skills through construction of various forms, layout and framing of floors, walls, and building structures and components.

Civil Engineering 210223

This is an introduction to residential and light commercial building construction and design. Students will learn basic sketching, architectural drafting skills with an emphasis on computer-aided drafting. In this class, students will design a structure relevant to today's modern architecture and create models of their designs with various materials and tools. Students will experience and solve many problems in designing or building structures with regard to environment and community impact and limitations from town planning, urban design and landscape architecture to furniture and objects. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Perform basic computer-aided drafting functions and develop knowledge and skills in the use of various software programs.
3. Create project planning documentation including site information and development options.
4. Conduct site planning including grading, public ingress/egress, utilities, landscaping, water supply, and wastewater management.
5. Develop architecture plans reflecting various architectural styles that include floor plans, elevations, sections and details, schedules, HVAC, plumbing, and electrical systems, as well as communication and protection systems.
6. Define and evaluate structural engineering components including foundations, columns, beams, and roof systems.
7. Develop presentations of potential construction projects.
8. Use principles and elements of design including portfolio development containing various written work, drawings, models, and other documentation.
9. Perform sketching and visualization using proper techniques and tools to produce pictorial, annotated sketches, multi-view or orthographic drawings using proper and accurate measurements.
10. Perform modeling using conceptual, graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
11. Conduct model analysis and verification.
12. Create model documentation including working drawings, dimensioning, and annotations.
13. Develop product presentations using proper communication techniques and appropriate presentation aids.

Electrical/Electronics Engineering 210232

In this course students will gain skills and knowledge through classroom and lab activities in the areas of basic DC and AC circuits, circuit components, codes, testing, electromagnetism and inductance, capacitance, power supplies, power generation and distribution, amplification, digital circuits, and computer fundamentals. Students will develop a basic understanding of the various types of energy and how energy is obtained. Students will learn the safe use of the tools, test instruments, equipment and supplies used in this course plus information on career opportunities in this field. Hands-on and problem-solving activities will expose students to areas of electron theory, Ohm's Law, insulators, conductors, electronic components, oscillators, and electronic fabrication. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Develop knowledge and understanding of programmable logic controllers and electrical motors.
3. Demonstrate safe and appropriate use of tools, machines, and materials in electrical and electronic technology.
4. Demonstrate understanding and apply knowledge of direct current circuits and alternating current circuits as related to electrical technology.
5. Describe, construct, conduct, and analyze experiments with basic DC and AC circuits and with circuits using magnetism.
6. Describe the structure of matter related to electricity and electronics.
7. Use Ohm's Law and Watt's Law to analyze and experiment with resistive circuits.
8. Describe, construct analyze and experiment with capacitive circuits.
9. Demonstrate the use of electrical and electronic equipment.
10. Demonstrate proper electronic assembly methods.
11. Demonstrate an understanding of basic electrical circuits and electronic systems.
12. Describe and experiment with integrated circuits.
13. Describe, construct, and experiment with circuits using semiconductors.

Engineering I 210221

This course applies the skills, concepts, and principles of engineering. Students explore various technological systems and engineering processes in related career fields. Topics include investigating technological system, design optimization, and problem solving. Students utilize CAD (computer-aided design) and physical and virtual modeling concepts to construct, test, collect, and report data. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Perform basic computer-aided drafting functions and develop knowledge and skills in the use of CAD (computer-aided design) software.
3. Research information about professional engineering-related organizations.
4. Use principles and elements of design including portfolio development containing various written work, drawings, models, and other documentation.
5. Perform sketching and visualization using proper techniques and tools to produce pictorial, annotated sketches, multi-view or orthographic drawings using proper and accurate measurements.
6. Apply geometric relationships of forms and shapes, lines, various polygons, geometric constraints, Cartesian coordinate system, and origin planes.
7. Perform modeling using conceptual, graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
8. Conduct model analysis and verification.
9. Create model documentation including working drawings, dimensioning, and annotations.
10. Develop product presentations using proper communication techniques and appropriate presentation aids.

Engineering II 210222

A project and research based course that extends the learning experiences where students focus on mechanical, electrical, fluid and thermal systems allowing in depth exploration in selected disciplines of engineering areas such as manufacturing, power/energy/transportation, robotics, hydraulics, electricity/electronics, communications, construction systems, alternative energy, computer-aided design, and problem solving. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Recognize how the history of design (including artistic periods, styles, and form and function) influences product development.
3. Research information about professional engineering-related organizations.
4. Develop and demonstrate competencies with various engineering drawings.
5. Research selected disciplines of engineering areas such as manufacturing, power/energy/transportation, bio-medical, robotics, hydraulics, electricity/electronics, communications, construction systems, and/or alternative energy, and incorporate computer-aided design and problem solving.
6. Develop solutions to problems within engineering areas such as manufacturing, power/energy/transportation, bio-medical, robotics, hydraulics, electricity/electronics, communications, construction systems, and/or alternative energy, and incorporate computer-aided design and problem solving.
7. Apply geometric relationships of forms and shapes, lines, various polygons, geometric constraints, Cartesian coordinate system, and origin planes.
8. Perform modeling using conceptual, graphical, physical, mathematical, and computer generated techniques, including 3-dimensional software.
9. Develop knowledge and understanding of basic electric, welding and industrial process and symbols.
10. Develop knowledge and understanding of concepts of CAD (computer-aided design), construction/fabrication techniques, structural systems, hydraulics, and pneumatics systems.
11. Conduct model analysis and verification.
12. Create model documentation including working drawings, dimensioning, and annotations.
13. Develop product presentations using proper communication techniques and appropriate presentation aids.

Engineering Capstone 210110

Engineering scope, content, and professional practices are presented through practical applications in this capstone course. Students in engineering teams apply technology, Kentucky Academic Standards, and skills to solve engineering design problems and create innovative designs. Students research, develop, test and analyze engineering designs using criteria such as design effectiveness, public safety, human factors and ethics. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Identify, define, and justify a technical design problem for resolution.
3. Conduct research and investigation into the stated problem.
4. Perform and graphically represent an evaluation of proposed design solutions using specific criteria, including product specifications.
5. Design a solution to the problem and create a working prototype for testing.
6. Evaluate and select appropriate testing methodologies for testing the product, conduct product testing, refine the design as needed, and document the process and results.
7. Create and deliver a formal presentation of the solution to the problem to community stakeholders.

Engineering Co-op 210330

Cooperative education is a paid educational program consisting of in-school instruction combined with the program related on-the-job work experience in a business or industrial establishment. These are planned experiences supervised by the school and the employer to ensure that each phased contributes to the student's Individual Learning Plan (ILP). Refer to the KDE Work-Based Learning Manual for further specifications. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Engineering Internship 210331

Internship provides supervised work-site experience for high school students associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Environmental Engineering 210250

This course will use the principles of engineering, soil science, biology, and chemistry to develop solutions to environmental problems. Students will work to improve recycling, waste disposal, public health, and water and air pollution control. They also address global issues, such as unsafe drinking water, climate change, and environmental sustainability. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Describe what environmental engineering is and what you may do as an environmental engineer.
2. Describe the similarities and differences of the environmental engineering career options.
3. Apply the professional codes of engineering ethics to evaluate situations that you may encounter in various environmental engineering careers.
4. Define sustainability.
5. Demonstrate knowledge of the main forms of air, water and land pollution.
6. Understanding how a wastewater and water treatment plant works.
7. Demonstrate knowledge of methods of pollution prevention inside a manufacturing plant.
8. Examine major forms of energy used to power humanity.
9. Compare various forms of energy and recognize advantages and disadvantages to each type.
10. Design and conduct reliable scientific experiments.
11. Analyze and interpret laboratory data.
12. Construct graphs (by hand and using graphing software).
13. Interpolate and extrapolate data from a graph.
14. Draw conclusions based on experimental data.
15. Thoroughly and clearly communicate results and conclusions both orally and in writing.

Industrial Engineering 210135

This course allows students the opportunity to develop a project from vision to reality by working with teams to design, engineer, manufacture, construct, test, redesign, and produce a finished project. This course can serve as capstone course working with business and industry as part of their design, development, fabrication, and marketing using skills and knowledge from previous manufacturing courses. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
3. Employ the manufacturing process including the designing, development, fabrication, troubleshooting and testing, problem solving and marketing various products.
4. Research and identify consumer demands for a manufactured product.
5. Prepare a plan for marketing and distributing a manufactured product.
6. Identify current and emerging careers related to technology.
7. Demonstrate safe and appropriate use of tools, machines, and materials.
8. Identify statics and strength of materials as it relates to their specific project(s).
9. Identify material classifications and properties utilizing appropriate testing methods as it relates to their specific project(s).
10. Use appropriate engineering methodology for maximizing product reliability.
11. Demonstrate technical knowledge and skills associated with processing activities and practices of industrial materials.
12. Evaluate various types of wood, wood composites and industry related materials as it relates to their specific projects.

Introduction to Aerospace 210226

This core aerospace and aviation course provides the foundation for all flight and aviation pathways. Students will gain an appreciation for the similarities and differences between aviation and aerospace. Students will also gain a historical perspective starting from the earliest flying machines to the wide variety of modern aircraft and the integral role they play in making today's world work. Students will learn about the history and impact of space exploration and have opportunities to build and fly historical and contemporary aircraft and spacecraft designs. Students will also begin to drill down into the various sectors of aviation and the parts that make up the aviation and aerospace ecosystem. They will discover how advances in aviation created a need for regulation and will learn about the promulgation of civil aviation oversight.
Participation in Kentucky Technology Student Association will greatly enhance instruction.

Recommended Grade Level: 9 – 10

Recommended Credit: 1

Students will:

1. Demonstrate an understanding of the history and development of aviation and space transportation.
2. Explain and demonstrate an understanding of the principles of flight including Bernoulli's Principle, Newton's Laws of Motion, Universal Gravitation, and the forces that affect flight.
3. Describe and demonstrate an understanding of basic aerodynamics and airfoils.
4. Describe how flight simulators are used for training and their importance.
5. Perform flight maneuvers in a simulator: straight and level, turns, and climbs and descents.
6. Demonstrate practical knowledge of digital technology and communications as it is related to aviation/aerospace projects.
7. Identify and model specific functions of various aircraft structures.
8. Describe and demonstrate an understanding of the materials that are used in aircraft design and development.
9. Understand various aviation professional organizations and government resources/entities.
10. Introduce aviation safety, risk management, and aeronautical decision making.
11. Explore and demonstrate the layout and general operations of the airport environment including chart supplements, runway layout, and airport information database.
12. Define and safety demonstrate Unmanned Aircraft Systems (UAS) types and operations and regulations.
13. Describe and demonstrate an understanding of rocketry/space system technology and its application in space environments.
14. Explore the role of spacecraft in the exploration and colonization of space.
15. Describe the aviation/aerospace industry nationally and in Kentucky.
16. Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.

Manufacturing Engineering 210225

This comprehensive course designed for the study of general concepts and principles of manufacturing and manufacturing systems. This course provides for hands-on learning experience which enhances the understanding of various metallic/nonmetallic materials, processes, and products. Materials studied may include polymers, ceramics, woods, composites, and metal materials associated with manufacturing. Students have the opportunity to engage in product design, prototyping, computer-assisted manufacturing applications, CNC machines, robotics, and production management. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Identify the basic processes, systems, designs, and materials used in manufacturing.
3. Identify product families.
4. Conduct model documentation as the process of recording details such as size, material development process that describes a model for the purpose of communication of ideas.
5. Apply the principles of design for manufacturing enabling the efficient and effective production of products.
6. Distinguish the difference between custom and industrial furniture production.
7. Demonstrate safe and appropriate use of tools, machines, and materials in materials and processes technology.
8. Select and defend a material for use in a product, explaining material properties and characterization, based upon manufacturing processes, chemical composition, internal defects, temperature, previous loading, dimensions and other factors.
9. Demonstrate an understanding of mechanisms and how they relate to manufacturing systems.
10. Apply the principles of robotics to automated systems.
11. Integrate control systems and equipment with production and production support mechanisms.
12. Demonstrate proficiency in the set-up and operation of manual and CNC wood and/or metalworking machines.
13. Demonstrate proficiency in computer-aided drafting/computer aided manufacturing (CAD/CAM) software.

Mechanical Engineering 210118

This course includes activities and real-world projects with state-of-the-art equipment and trainers. Students explore and study an introduction to engineering, engineering design problem solving, and engineering graphics with a 3-D parametric modeling software. Students prototype a part design and prepare the manufacturing process using a 3-D printer, computer numeric control (CNC) Vertical Mill, computer numeric control (CNC) turning center, a material handling robot and/or plastic molding machine. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Demonstrate an understanding of manufacturing, its history, models, and procedures.
3. Demonstrate an understanding of control systems and methods to describe or document their processes.
4. Demonstrate an understanding of the cost of manufacturing.
5. Demonstrate proficiency in designing products for manufacturability.
6. Demonstrate an understanding of manufacturing processes.
7. Demonstrate an understanding of computer numeric control (CNC) as it relates to product design and development.
8. Demonstrate an understanding of automation and robotics relative to the manufacturing process.
9. Demonstrate an understanding of the elements of power and the associated mathematics.
10. Build, program, and configure a robot to perform predefined tasks.
11. Demonstrate an understanding of the elements of Computer Integrated Manufacturing (CIM).
12. Demonstrate proficiency in designing an efficient flexible manufacturing system (FMS) that contains Computer Integrated Manufacturing (CIM) elements.

Mechatronics Engineering 210230

Mechatronics Engineering is an electro-mechanical systems course that provides students with instruction and experience with mechanical devices, actuators, sensors, electronics, intelligent controllers and computers. Students gain an understanding of the principles of electricity and mechanics and their application to gears, including hydraulic/pneumatic equipment, cams, levers, circuits, and other devices used in the manufacturing process or within manufactured goods. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Define engineering systems including mechanisms, thermodynamics, fluid systems, electrical systems and control systems.
3. Demonstrate a fundamental understanding of electronics and electricity.
4. Apply troubleshooting and critical thinking skills to define the problem.
5. Identify material classifications and properties utilizing appropriate testing methods.
6. Calculate work and power in mechanical systems.
7. Measure forces and distances related to simple machines and mechanisms.
8. Calculate mechanical advantage and drive ratios of mechanisms.
9. Design, create, analyze and produce a mechanical system.
10. Demonstrate proficiency in using tools, instruments and test devices.
11. Demonstrate a fundamental understanding of AC/DC electrical and electrical control.
12. Demonstrate an understanding of industrial safety, health, and environmental requirements.
13. Apply the principles of robotics to industrial automation systems.
14. Demonstrate proficiency in computer control and robotics.
15. Operate, troubleshoot, pneumatic, hydraulic and electromechanical components and/or systems.
16. Use machine interfaces to control automated systems.
17. Define dynamics/kinematics including linear and trajectory motion.

Robotics Automation and Design 210239

This course provides students with content and skills essential to the design and operation of robotic systems. Students' activities will include artificial intelligence specialized sensors, electronic applications, engineering technologies, environmental physics, manufacturing, topographical considerations, programming, motions physics, electric motors, communications, simulations, simulation and modeling, and critical thinking skills. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Correlate elements of artificial intelligence to their functions in robotics.
3. Describe the various classification schemes of sensors applicable to robotics.
4. Explain how electronic devices are used in the operation of a robotic assembly.
5. Demonstrate an understanding of various technologies used in the design of robotic assemblies.
6. Demonstrate an understanding of advanced mathematics and physics associated with the design of a robotic assembly.
7. Create a program to control a robotic mechanism.
8. Describe the operation and use of various forms of electrical motors in robotic assemblies.
9. Demonstrate an understanding of basic 3-D modeling concepts as it relates to robotics.
10. Analyze and apply data and measurements to solve problems and interpret documents.
11. Design, build, program, and configure a robot to perform predefined tasks.
12. Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.
13. Describe the approaches, challenges, and problem-solving methodologies involved with integrating artificial intelligence into robotic systems.
14. Describe the role of specialized sensors in the design and operation of robotic systems.
15. Describe the use of specialized electronic applications used in robotic systems.
16. Demonstrate an understanding of the impact of robotics on the manufacturing process.
17. Create a program to control a robotic system.
18. Demonstrate an understanding of technologies for communication with and among robotic systems.

Robotics Engineering 210238

This course provides students with the foundation in content and skills associated with robotics and automation, including artificial intelligence, electronics, physics, and principles of engineering. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Demonstrate an understanding of robotics, its history, applications, and evolution.
3. Describe Artificial Intelligence (AI) and the forms of applied logic.
4. Describe the role of sensors in the field of robotics.
5. Demonstrate an understanding of the foundations of electronics.
6. Describe the operation of basic electronic devices used in robotics.
7. Demonstrate an understanding of engineering principles.
8. Explain fundamental physics concepts applicable to the field of robotics.
9. Demonstrate the safe and proper use of electronic and other lab equipment, tools, and materials.
10. Build, program, and configure a robot to perform predefined tasks.
11. Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.

Space Systems Engineering I 210235

This course introduces students to satellites and space systems: orbital mechanics; the space environment; satellite application; spacecraft design consideration; the roles universities, industry and government play in space exploration, and future technologies of spacecraft and satellites. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Demonstrate an understanding of the history and development of aviation and space transportations.
3. Demonstrate an understanding of power systems including internal combustion engines, jet engines, rocket engines, solar cells and nuclear power used in aviation/aerospace applications.
4. Describe the space environment and types of spacecraft.
5. Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aerospace environments.
6. Demonstrate a knowledge and understanding of processing skills on materials and composites as they relate to aerospace technologies.
7. Describe orbital motion and compute orbital elements and calculations.
8. Explore the role of civilian spacecraft in the exploration and colonization of space.
9. Acquire a number of technical skills that are in high demand in the workforce: the ability to work as a member of a team, to write quality technical reports and to give formal oral presentations.
10. Attain extensive experience in computer programming, modeling, and data acquisition and analysis.
11. Use computers and high-tech instrumentation to monitor and control technical systems, including the large structures of space tracking antennas.
12. Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.
13. Demonstrate science and mathematics knowledge and skills.
14. Explore various career opportunities and requirements in the field of aerospace engineering, technicians, and scientists.
15. Use oral and written communication skills in creating, expressing ant interpreting information and ideas.

Space Systems Engineering II 210236

An instructional program in astronautics designed to develop basic knowledge of space systems and to gain practical experience in designing, fabricating, and testing space type experiments. Students will learn and understand the constraints on device design to operate in the LEO (Low Earth Orbit) space environment. Students will also get hands-on experience in a laboratory environment and in the safe use of shop equipment. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Demonstrate an understanding of the history and development of aviation and space transportation.
3. Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aerospace environments.
4. Describe various space-rated materials and structures utilized for spacecraft.
5. Understand space vehicle control systems, attitude control, attitude determination, passive and active control systems.
6. Demonstrate how manufacturing processes are utilized in space technology.
7. Develop an understanding of launch procedures, payload requirements, pre-flight testing and flight operations.
8. Describe orbital motion and compute orbital elements and calculations.
9. Explore the role of civilian spacecraft in the exploration and colonization of space.
10. Acquire a number of technical skills that are in high demand in the workforce: the ability to work as a member of a team, to write quality technical reports, and to give formal oral presentations.
11. Attain extensive experience in computer programming, modeling, and data acquisition and analysis.
12. Use computers and high-tech instrumentation to monitor and control technical systems, including the large structures of space tracking antennas.
13. Develop an understanding of concepts of physics, space science, communications electronics, and mathematics.
14. Demonstrate an understanding of the effects of flight as it relates to physiology.
15. Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.

Technical Design I 210138

This course will provide students with instruction in the characteristics and evolution of drafting technology, underlying principles of design and fundamental knowledge and skills in the use of mechanical drawing, illustrations, and various forms of mechanical drawings, geometry and applied mathematics that apply to engineering design. Introduction to various forms of computer aided software to gain basic skills and knowledge. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Define and demonstrate appropriate technical drawings based on design solution.
3. Use basic drafting tools and techniques and develop accurate measurement techniques to communicate drafting ideas.
4. Demonstrate various drawing scales used in technical drawing.
5. Through the use of basic drafting equipment, students will produce geometric shapes and figures that describe various objects, structures, and designs.
6. Demonstrate knowledge and skill with illustration technique and working drawings.
7. Demonstrate basic mathematic concepts in basic arithmetic, algebra, geometry, and trigonometric to solve problems and apply multiple discipline calculations.
8. Prepare mechanical drawings that consist of, but not limited to, isometric, oblique, 3-view orthographic projections, auxiliary views, sectional and dimensions.

Technical Design II 210108

This course contributes to the development of each high school student's capability to understand how technology's development, control, and use are based on design constraints and human wants and needs. The structure of the course challenges students to use technological design processes so that they can think, plan, design, and create solutions to engineering and technological problems. Students are actively involved in the organized and integrated application of technological resources, engineering concepts, and scientific procedures. Students address the complexities of technology that stem from designing, developing, using, and assessing technological systems. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Engineering I 210221 and/or Engineering II 210222

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Use the design process to fabricate products related to one or more of the seven contexts of technological literacy (agriculture, bio-related, medical, construction, manufacturing, transportation, and communications).
3. Engage in meaningful, hands-on, minds-on, technology-based activities using tools, machines, materials, and processes.
4. Analyze various design concepts, constraints, and processes related to product development employing critical thinking skills.
5. Work individually, in teams, or as a total class to solve design-related activities.
6. Identify opportunities, characteristics, and preparation requirements for current and emerging design related occupations.

Unmanned Aircraft Systems 210251

Recommended Grade Level: This course is an introduction to unmanned aircraft systems (UAS). A history of UAS, typical applications and an overview of regulations, airframe and powerplant systems, sensors, ground control stations, airspace, weather, and other foundational skills needed to safely operate UAS in the U.S. airspace systems will be covered. This course will incorporate hands-on practical applications and will give students the opportunity to design, build, and pilot UAS, both remotely and autonomously. Students will be prepared to complete the *Federal Aviation Administration's Part 107 Remote Pilot* written exam upon completion of this course. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Explain some of the significant milestones in the history of UAS.
2. Describe several commercial and military applications of UAS.
3. Identify and define the major components on an UAS.
4. Explain how sensing systems function in an UAS.
5. Describe the fundamentals of airframe and powerplant design for UAS
6. Describe the fundamentals of communication, command, and control for UAS.
7. Explain the basic principles of detect and avoid.
8. Interpret a VFR sectional aeronautical chart.
9. Locate and interpret NOTAMs.
10. Evaluate launch sites for UAS operations.
11. Explain the different classes of airspace and the restrictions on UAS operations in each.
12. Read and interpret aviation weather reports including METARs, TAFS, SIGMETS, and AIRMETS.
13. Describe the rules for UAS operations as defined in FAA CFR part 107.
14. Determine the effects of aircraft loading, weight and balance on UAS operation.
15. Design, build, and pilot a UAS safely and effectively.
16. Operate a UAS both remotely and autonomously.
17. Use proper radio communication procedures.
18. Identify physical and psychological factors that affect UAS operations.
19. Describe preflight and preventative maintenance procedures for an UAS.
20. Explain airport operations that could impact UAS operations.
21. Apply aeronautical decision making and judgement during use of UAS.

FLIGHT AND AVIATION CAREER PATHWAYS

Aircraft Maintenance Technician CIP 47.0607.00

This pathway prepares individuals to apply technical knowledge and skills to repair, service, and maintain all aircraft components other than engines, propellers, avionics, and instruments. It includes instruction in layout and fabrication of sheet metal, fabric, wood, and other materials into structural members, parts, and fittings, and replacement of damaged or worn parts such as control cables and hydraulic units.

To gain FAA work experience and training requirements, students must log hours and work with approved FAA rated Airframe and Powerplant Technicians or Inspection Authorized persons.

BEST PRACTICE COURSES

Complete (3) three credits:

- 210226 Introduction to Aerospace
- 210233 Fundamentals of Aviation Science
- 210139 Introduction to Aircraft Maintenance Technology

Choose (1) one credit from the following:

- 210240 Aviation Capstone
- 210330 Engineering Co-op **OR** 210331 Engineering Internship

Flight and Aeronautics CIP 49.0102.00

Students will complete what is considered the first phase of aviation training leading to a commercial pilot license. They will gain technical knowledge and skills to the flying and/or navigation of commercial passenger and cargo, agricultural, public service, corporate aircraft flight systems and controls, flight crew operations and procedures, radio communications, navigation procedures and systems, airways safety and traffic regulations, and governmental rules and regulations pertaining to piloting aircraft.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210226 Introduction to Aerospace
- 210233 Fundamentals of Aviation Science

Choose (2) two credits from the following:

- 210234 Aviation Science
- 210237 Commercial Aviation Science
- 210229 Aerospace Engineering
- 210251 Unmanned Aircraft Systems
- 210240 Aviation Capstone
- 210330 Engineering Co-op **OR** 210331 Engineering Internship

FLIGHT AND AVIATION COURSES

Aerospace Engineering 210229

This course will introduce the principles of flight and aerodynamics and lay the ground work for applying engineering principles. This aerodynamics course focuses on the study of the flow of air about an airfoil. Students will interact with technology which simulates various airfoil designs and determines airflow around various shapes. This course also introduces aerospace engineering as an interdisciplinary profession, including other areas of engineering. Students will learn the engineering design process, which includes defining the need or problem, researching related principles and solutions, creating designs, testing prototypes, evaluating, and redesigning. Relationships between aircraft performance and other aspects of engineering (such as designing runways) will also be explored. Students will learn to analyze and interpret data to improve performance. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Identify the various vehicles used for human flight.
3. Identify and explain the forces acting on an airplane, how the main components of the airplane control these forces, and how changes to the design of the airplane affect performance.
4. Conduct model analysis and verification.
5. Create model documentation including working drawings, dimensioning, and annotations.
6. Use modeling and spreadsheet software to design and analyze data from various airfoil shapes.
7. Identify the various instruments used to measure the lift and drag forces generated by an airfoil in a wind tunnel.
8. Communicate test results through a technical report and a presentation to the class.
9. Develop knowledge about the evolving technology of aerial navigation including visual flight rules (VFR), instrument flight rules (IFR), visual omnirange (VOR), Wide Area Augmentation System (WAAS), Local Area Augmentation System (L.A.A.S.), and Synthetic Vision systems to the Global Positioning System.
10. Define terms and concepts of the design, flight, and forces on a rocket and be able to explain how they interact.
11. Use trigonometry to calculate performance of rockets.
12. Explain basic orbit theory satellite motion and orbit parameters.

13. Work cooperatively in a team to design and conduct experiments related to positive G-force.
14. Analyze various materials to determine their appropriate application in space craft.
15. Design a computer-driven system for a robot to perform a series of predetermined functions without having anything impede its progress while successfully delivering a payload to a predetermined location.
16. Design, build, and test an intelligent vehicle that will meet criteria determined by students.

Aviation Capstone 210240

Aviation scope, content, and professional practices are presented through practical applications in this capstone course. In teams students apply technology, Kentucky Academic Standards, and skills to solve aviation design problems and create innovative designs. Students research, develop, test and analyze aviation designs using criteria such as design effectiveness, public safety, human factors and ethics. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Introduction to Aerospace 210226 and/or Fundamentals of Aviation Science 210233

Recommended Grade Level: 11-12

Recommended Credit: 1

Students will:

1. Complete tasks as determined by the instructor.

Aviation Science 210234

This course prepares students for flight training and aircraft operations. Students will gain knowledge and skills in airport systems, air traffic control procedures, aviation weather, air navigation, radio communication procedures, and Federal Aviation Regulations (FAR's). This course covers the history of aviation law, federal regulation of air transportation and the role of state and federal government in aviation law including functions of the Federal Aviation Administration. Students will become familiar with aircraft power plants, principles of flight, aircraft systems/instruments, and science of weather. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Introduction to Aerospace 210226 and/or Fundamentals of Aviation Science 210233

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Demonstrate an understanding of the history and development of aviation and space transportation.
3. Recognize the important milestones prior to the first successful flight.
4. Describe and demonstrate an understanding of the principles of flight.
5. Describe different wing platforms and how they alter flight performance and characteristics.
6. Demonstrate an understanding of power systems including internal combustion engines, jet engines, rocket engines, solar cells and nuclear power used in aviation/aerospace applications.
7. Describe the important developments in commercial aviation following the war and how the world changed its attitudes toward passenger airlines.
8. Recognize the major developments in air warfare during WWII and the impact of future aviation.
9. Describe the major materials and methods of aircraft construction.
10. Describe and demonstrate principles of navigation.
11. Define the term general aviation and be able to recognize the major fields within the general aviation community.
12. Know the most important and successful airplanes and their manufacturers.
13. Describe various factors critical to aircraft performance.
14. Demonstrate an understanding of the differences between wing and rotary aircraft flight principles and characteristics.

Commercial Aviation Science 210237

This course discusses the Federal Aviation Regulations covering the privileges, limitations, and operations of a commercial pilot, and the operations for which an air taxi/commercial operator, agricultural aircraft operator, and external load operator certificate, waiver, or exemption is required. The course also discusses the safe and efficient operation of airplanes, including inspection and certification requirements, operating limitations, high altitude operations and physiological considerations, loading computations, the significance of the use of airplane performance speeds, the computations involved in runway and obstacle clearance and cross wind component considerations, and cruise control. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Introduction to Aerospace 210226 and/or Fundamentals of Aviation Science 210233

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Demonstrate an understanding of the history and development of the commercial aviation industry.
3. Describe the commercial aviation industry environment.
4. Describe and demonstrate an understanding of commercial pilot aerodynamics.
5. Demonstrate an understanding of electrical, mechanical, fluid, and pneumatic systems that could be used on/in aviation/aerospace environments.
6. Demonstrate an understanding of advanced aircraft systems to include turbine engines, hydraulic flight controls, environmental systems and GPS navigation.
7. Demonstrate technical knowledge of the Air Traffic Control systems as it is related to commercial aviation technology.
8. Demonstrate knowledge of positive exchange of the flight controls procedures.
9. Demonstrate a knowledge and understanding of processing temporary flight restrictions (TFRs).
10. Describe and demonstrate principles of ADM and risk management.
11. Explore the role of the “Air Taxi” charter flight services.
12. Describe various factors critical to aircraft performance in high performance aircraft.
13. Demonstrate appropriate skills in analyzing and evaluating technological advancements as reported by the media.
14. Perform advanced study and technical skills related to commercial aviation standards.
15. Demonstrate an understanding of career opportunities and requirements in the field of the commercial aviation and commercial pilots.

Engineering Co-op 210330

Cooperation Education is a paid education program consisting of in-school instruction combined with the program related on-the-job work experience in a business or industrial establishment. These are planned experiences supervised by the school and the employer to ensure that each phase contributes to the student's Individual Learning Plan (ILP). Refer to the KDE Work-Based learning Manual for further specifications. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Engineering Internship 210331

Internship for CTE courses provides supervised work-site experience for high school students associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Fundamentals of Aviation Science 210233

This course will introduce students to basic aircraft structures and their major components, principles of flight, and the fundamental physical laws affecting flight. Students will learn about basic aerodynamics and forces that act on aircraft in flight. This course will provide students with a foundational understanding of basic physics concepts related to flight. Design characteristics will be covered, including concepts surrounding aircraft stability, controllability, and the effect of weight and balance on flight performance. The course will cover primary and secondary flight control systems. It also covers the different types of power plants and how they support the operation of the aircraft. Students will learn about several different types of fuel systems and gain an understanding of the critical components of aircraft electrical systems. Finally, students will learn about various systems that drive flight instruments and how those flight instruments operate. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will apply the design process to:

1. Communicate the importance of aviation safety including aeronautical decision making, risk management, positive aircraft control, stall/spin awareness, collision avoidance, runway incursion avoidance, and checklist usage.
2. Explain and demonstrate the interrelationships among aerodynamic forces that affect an aircraft on the ground and in flight.
3. Describe the characteristics and functions of aircraft control surfaces.
4. Compare and contrast the characteristics and operating principles of various power plants.
5. Distinguish between the functions and characteristics of primary flight instruments.
6. Perform intermediate flight maneuvers in a simulator: standard rate turns, advanced turns, constant angle turns, constant speed climbs, constant rate climbs, climbing and descending turns, power on/off stalls, traffic pattern operations, and landings.
7. Recognize airport lighting, markings, and signage.
8. Identify the different elements of each classification of airspace.
9. Demonstrate ATC/pilot communication procedures with the use of correct terminology and radio phraseology.
10. Utilize dead reckoning and pilotage to navigate.
11. Use self-assessment checklist to determine fitness of flight according to basic aviation physiology.
12. Apply basic meteorological principles to weather theory and aviation weather reports.
13. Demonstrate crew resource management principles of manned and unmanned aircraft.

Introduction to Aerospace 210226

This core aerospace and aviation course provides the foundation for all flight and aviation pathways. Students will gain an appreciation for the similarities and differences between aviation and aerospace. Students will also gain a historical perspective starting from the earliest flying machines to the wide variety of modern aircraft and the integral role they play in making today's world work. Students will learn about the history and impact of space exploration and have opportunities to build and fly historical and contemporary aircraft and spacecraft designs. Students will also begin to drill down into the various sectors of aviation and the parts that make up the aviation and aerospace ecosystem. They will discover how advances in aviation created a need for regulation and will learn about the promulgation of civil aviation oversight.
Participation in Kentucky Technology Student Association will greatly enhance instruction.

Recommended Grade Level: 9 – 10

Recommended Credit: 1

Students will:

1. Demonstrate an understanding of the history and development of aviation and space transportation.
2. Explain and demonstrate an understanding of the principles of flight including Bernoulli's Principle, Newton's Laws of Motion, Universal Gravitation, and the forces that affect flight.
3. Describe and demonstrate an understanding of basic aerodynamics and airfoils.
4. Describe how flight simulators are used for training and their importance.
5. Perform flight maneuvers in a simulator: straight and level, turns, and climbs and descents.
6. Demonstrate practical knowledge of digital technology and communications as it is related to aviation/aerospace projects.
7. Identify and model specific functions of various aircraft structures.
8. Describe and demonstrate an understanding of the materials that are used in aircraft design and development.
9. Understand various aviation professional organizations and government resources/entities.
10. Introduce aviation safety, risk management, and aeronautical decision making.
11. Explore and demonstrate the layout and general operations of the airport environment including chart supplements, runway layout, and airport information database.
12. Define and safety demonstrate Unmanned Aircraft Systems (UAS) types and operations and regulations.
13. Describe and demonstrate an understanding of rocketry/space system technology and its application in space environments.
14. Explore the role of spacecraft in the exploration and colonization of space.
15. Describe the aviation/aerospace industry nationally and in Kentucky.
16. Demonstrate an understanding of career opportunities and requirements in the field of aerospace technologies.

Introduction to Aircraft Maintenance Technology 210139

The purpose of this course is for students to develop basic knowledge and personal skills that can be applied to a broad range of career opportunities with emphases to aviation maintenance technology. Students will gain experience in electricity and electronics, metalworking, woodworking, plastics and composite materials through the use of tools, machines and materials that's are basic to aviation industry. It will cover both hand and machine-tool operations and supplies background knowledge on equipment and processes utilized in aviation industry and manufacturing. The program allows students to learn basic problem solving skills, instruction in mechanical drawing, blue print reading, engineering CAD, and the application of engineering concepts and mathematics. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Introduction to Aerospace 210226 and/or Fundamentals of Aviation Science 210233

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply the design process involving problem identification, conceptualization, and research, refinement of preliminary ideas, design analysis, development and implementation, detailed documentation of final design, optimization and final presentation.
2. Perform basic electricity skills.
3. Perform basic aircraft drawing skills.
4. Demonstrate aircraft weight and balance skills.
5. Maintain aircraft fluid lines and fittings.
6. Perform aircraft materials and processing skills.
7. Perform cleaning and corrosion-control operations.
8. Apply basic physics to aircraft systems.
9. Demonstrate appropriate understanding of basic science.
10. Demonstrate the use of maintenance publications.
11. Interpret mechanic privileges and limitations.
12. Identify Federal Aviation Administration (FAA) licensing requirements.
13. Demonstrate appropriate communication skills.
14. Demonstrate employability skills as an Aviation General Maintenance Technician Helper.
15. Maintain wood structures.
16. Perform aircraft covering.
17. Apply aircraft finishes.
18. Repair sheet-metal structures.

Unmanned Aircraft Systems 210251

Recommended Grade Level: This course is an introduction to unmanned aircraft systems (UAS). A history of UAS, typical applications and an overview of regulations, airframe and powerplant systems, sensors, ground control stations, airspace, weather, and other foundational skills needed to safely operate UAS in the U.S. airspace systems will be covered. This course will incorporate hands-on practical applications and will give students the opportunity to design, build, and pilot UAS, both remotely and autonomously. Students will be prepared to complete the *Federal Aviation Administration's Part 107 Remote Pilot* written exam upon completion of this course. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Prerequisites: Introduction to Aerospace 210226 and/or Fundamentals of Aviation Science 210233

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Explain some of the significant milestones in the history of UAS.
2. Describe several commercial and military applications of UAS.
3. Identify and define the major components on an UAS.
4. Explain how sensing systems function in an UAS.
5. Describe the fundamentals of airframe and powerplant design for UAS
6. Describe the fundamentals of communication, command, and control for UAS.
7. Explain the basic principles of detect and avoid.
8. Interpret a VFR sectional aeronautical chart.
9. Locate and interpret NOTAMs.
10. Evaluate launch sites for UAS operations.
11. Explain the different classes of airspace and the restrictions on UAS operations in each.
12. Read and interpret aviation weather reports including METARs, TAFS, SIGMETS, and AIRMETS.
13. Describe the rules for UAS operations as defined in FAA CFR part 107.
14. Determine the effects of aircraft loading, weight and balance on UAS operation.
15. Design, build, and pilot a UAS safely and effectively.
16. Operate a UAS both remotely and autonomously.
17. Use proper radio communication procedures.
18. Identify physical and psychological factors that affect UAS operations.
19. Describe preflight and preventative maintenance procedures for an UAS.
20. Explain airport operations that could impact UAS operations.
21. Apply aeronautical decision making and judgement during use of UAS.

FAMILY AND CONSUMER SCIENCES EDUCATION

FAMILY AND CONSUMER SCIENCES EDUCATION CAREER PATHWAYS

Consumer and Family Management CIP 19.0403.00

The Consumer and Family Management pathway helps students develop knowledge and skills that span across a broad range of Family and Consumer Sciences content areas and are central to career areas involving human services, consumer services, consumer protection, and advising, education and training as well as social and community services.

BEST PRACTICE COURSES

Choose (3) three credits from the following:

- 200113 FACS Essentials **AND/OR** 200161 FACS Essentials Health (.5 credit)
- 201010 Money Skills **OR** 201011 Money Skills for Math **OR** 201015 Consumer Economics within Social Studies
- 200171 Relationships (.5 or 1 credit)
- 200441 Foods and Nutrition

Choose (1) one credit from the following:

- 200226 Middle to Late Lifespan Development (.5 or 1 credit)
- 200173 Parenting (.5 or 1 credit)
- 200192 Internship: Consumer and Family Management
- 200191 Co-op: Consumer and Family Management

Consumer and Family Management TRACK CIP 19.0403.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from the partnering secondary consumer and family management course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide the student with a Consumer and Family Management co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK Website.

Culinary and Food Services CIP 12.0500.00

The Culinary and Food Service Pathway addresses a skill set necessary for success in the culinary industry. The courses in this pathway will help students develop skills in early career ladder positions and promote continuing education at the post-secondary level preparing for careers associated with restaurants, institutional food service, hospitality, and catering, as well as food and beverage operations.

BEST PRACTICE COURSES

Complete (3) three credits:

- 200441 Foods and Nutrition
- 200411 Culinary Arts I
- 200412 Culinary Arts II

Choose (1) one credit from the following:

- 200113 FACS Essentials **AND/OR** 200161 FACS Essentials Health (.5 credit)
- 200442 Advanced Foods and Nutrition (.5 or 1 credit)
- 200478 Internship: Culinary Arts
- 200409 Co-op: Culinary Arts

Early Childhood Education CIP 13.1210.00

The Early Childhood Education pathway will address a skill set necessary for success in early childhood education so that individuals can teach students ranging in age from infancy though eight years (grade three), depending on the school system or state regulations. This pathway is targeted for individuals preparing for careers related to early childhood education, such as those associated with child care, teaching, community-based children's programs, social services or counseling for children, and after-school programs.

BEST PRACTICE COURSES

Complete (3) three credits:

- 200223 Early Lifespan Development
- 200261 Child Development Services I
- 200262 Child Development Services II

Choose (1) one credit from the following:

- 200113 FACS Essentials **AND/OR** 200161 FACS Essentials Health (.5 credit)
- 331020 Principles of Teaching
- 200171 Relationships (.5 or 1 credit)
- 200173 Parenting (.5 or 1 credit)
- 200210 Co-op: Early Childhood Education
- 200201 Internship: Early Childhood Education

Early Childhood Education Track CIP 13.1210.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from the partnering secondary early childhood education course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide the student with an Early Childhood Education co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK Website.

Fashion and Interior Design CIP 50.0407.00

The Fashion and Interior Design pathway will address a skill set necessary for success in the fashion industry as well as a career in the residential housing and furnishings industry. This pathway targets individuals who are interested in pursuing careers in the following areas: retail and wholesale buying, apparel and textile development and production, fashion and textile design, and visual merchandising as well as public and private sector housing programs, residential property and facility management, real estate, retail home furnishings, or home decorating and staging.

BEST PRACTICE COURSES

Choose (3) three credits from the following:

- 200113 FACS Essentials
- 200821 Fashion and Interior Design I
- 200825 Fashion and Interior Design II
- 200826 Fashion and Interior Design III

Choose (1) one credit from the following:

- 201010 Money Skills **OR** 201011 Money Skills for Math
- 200810 Co-op: Fashion and Interior Design
- 200801 Internship: Fashion and Interior Design

Food Science and Dietetics CIP 51.3199.00

The Food Science and Dietetics pathway addresses competencies and a skill set necessary for success as a pre-professional in a career with a substantial focus on food science. It will facilitate employment in early career ladder positions and promote continuing education at the post-secondary level in career areas involving food science, food safety, food quality, food technology, or food preservation and packaging.

BEST PRACTICE COURSES

Choose (3) three credits from the following:

- 200441 Foods and Nutrition
- 200442 Advanced Foods and Nutrition (.5 or 1 credit)
- 200415 Nutritional Food Science
- 200414 Fundamentals of Dietetics

Choose (1) one credit from the following:

- 200113 FACS Essentials **OR** 200161 FACS Essentials Health (.5 credit)
- 010702 Food Science and Technology
- 200492 Internship: Food Science and Dietetics
- 200491 Co-op: Food Science and Dietetics

Fundamentals of Teaching CIP 13.1308.00

The Fundamentals of Teaching pathway will facilitate employment in early career ladder positions and promote continuing education at the post-secondary level preparing for careers associated with education and training in public and private school programs, elementary, middle, and secondary schools, after-school programs; higher education, nonprofit, and corporate settings.

BEST PRACTICE COURSES

Complete (3) three credits:

- 200223 Early Lifespan Development
- 200226 Middle to Late Lifespan Development (.5 or 1 credit)
- 331020 Principles of Teaching

Choose (1) one credit from the following:

- 200199 FACS Leaders at Work
- 200113 FACS Essentials
- 200171 Relationships (.5 or 1 credit)
- 200292 Internship: Fundamentals of Teaching
- 200291 Co-op: Fundamentals of Teaching

Hospitality, Travel, Tourism and Recreation CIP 52.1910.00

The Hospitality, Travel, Tourism and Recreation career pathway prepares individuals to provide services in the hospitality and leisure fields. Includes instruction in hospitality operations; customer sales; marketing techniques; assistance operations and techniques; basic office management; sports, recreation and equipment management; and food and beverage services. The Hospitality, Travel, Tourism and Recreation career pathway is a hybrid pathway that consists of courses within Family Consumer Sciences Education and Marketing Education. It blends two program areas to help students explore technical skills in the industry.

BEST PRACTICE COURSES

Choose (3) three credits from the following:

- 080910 Principles of Hospitality **OR** 200610 Principles of Hospitality
- 080716 Marketing Principles
- 200641 Specialized Services in Hospitality
- 080717 Marketing Applications
- 080911 Travel and Tourism Marketing
- 200442 Advanced Foods and Nutrition

Choose (1) one credit from the following:

- 080310 Principles of Entrepreneurship
- 200441 Foods and Nutrition **OR** 200113 FACS Essentials
- 200601 Internship: Hospitality, Travel, Tourism and Recreation
- 200690 Co-op: Hospitality, Travel, Tourism and Recreation
- 080708 Marketing Education Internship
- 080707 Marketing Education Co-op
- 060109 Ethical Leadership

FAMILY AND CONSUMER SCIENCES COURSES

Advanced Foods and Nutrition 200442

This course is designed to assist students in principles related to food preparation. Specific content addressed will include planning, serving, food presentation, special diets, and nutrition for the lifespan, serving, and food planning for entertainment services. An emphasis on careers related to food service and nutrition will be addressed. Lab instruction emphasizes the application process.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 – 1

Students will:

1. Apply menu planning principles to develop and modify menus.
2. Prepare various meats, seafood, and poultry.
3. Prepare various stocks, soups, sauces, and gravies.
4. Prepare canapés and appetizers.
5. Manage a safe, effective, and productive lab while utilizing teamwork.
6. Apply principles of purchasing, cost per serving, and receiving in food service operations.
7. Plan, prepare, and serve a variety of meals and special events.
8. Apply the fundamentals of baking to a variety of products including yeast breads, pie crust, pastries, and other breads.
9. Develop a plan for weight loss, weight gain, or maintenance while examining nutrition through the life cycle (infant, children, teens, pregnancy, adulthood, and elderly).
10. Plan and examine a diet plan for a specific need such as high fiber, low fat, low cholesterol, low sodium, diabetic, athlete, heart disease, or lactose intolerance.
11. Illustrate table settings for special occasions.
12. Practice using different styles of meal service.
13. Demonstrate and determine the correct cooking methods for a variety of food products such as roasting, baking, broiling, smoking, grilling, sautéing, frying, deep frying, braising, stewing, poaching, steaming, woking, convection, microwaving, and other emerging technologies.
14. Use garnishes to plan a simple food gathering for entertainment purposes.
15. Demonstrate proper safety, sanitation and storage techniques in handling food from purchase, preparation, cooking, cooling, to reheating.
16. Research careers in nutrition/food service according to skill required and type of job.
17. Prepare a variety of regional and international foods using appropriate methods and techniques.
18. Use nutritional information in preparing and serving food to guests.
19. Operate tools and equipment following safety procedures and OSHA (Occupational Safety and Health Administration) requirements.
20. Apply principles of food preparation to produce a variety of food products and beverages.
21. Practice food presentation techniques.

22. Demonstrate proper measuring techniques.
23. Assess employment opportunities and preparation requirements.
24. Demonstrate employability and social skills relevant to the industry.
25. Demonstrate safe, sanitary work habits required by the field.
26. Demonstrate and practice knowledge of food service safety and sanitation procedures and the factors that contribute to food borne illness.
27. Practice proper waste disposal and recycling methods.
28. Demonstrate written, verbal, and non-verbal communication skills.
29. Apply time management skills.
30. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
31. Apply math, science, and communication skills within technical content.

Child Development Services I 200261

This course provides training for entry-level positions in early childhood education programs. Students study professionalism, employability skills, child growth and development, health, safety and nutrition, learning environments and curriculum, child assessment, program management and evaluation as well as family and community partnerships. The subject content is reinforced with work experience in a variety of child care establishments. Leadership development will be provided through the Family, Career and Community Leaders of America (FCCLA).

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 2

Students will:

1. Analyze the principles of child development.
2. Explore the philosophies of leading child development theorists.
3. Examine the physical, cognitive, emotional and social development of infants, toddlers, and preschool age children.
4. Analyze ways to accommodate special needs of exceptional and disabled children.
5. Identify the need for quality child care centers and describe the types of programs.
6. Analyze a daily schedule for infants, toddlers, and preschool children in group care.
7. Organize art, music, language arts, math, and science activities for young children.
8. Identify the types of records and observation tools to assess children's growth and development.
9. Outline general safety precautions for children in group care.
10. Explain procedures for caring for an ill child.
11. Explain procedures for caring for a child who has had an accident.
12. Identify agencies that provide services to children and parents.
13. Demonstrate skills in caring for young children in a variety of settings.
14. Identify the competencies of early childhood workers.
15. Determine career opportunities in child care, specifying requirements of the Early Care and Education Orientation Certificate, the Commonwealth Child Care Credential, the Pediatric Abusive Head Trauma and the Child Development Associate.
16. Demonstrate employability and social skills relevant to the industry.
17. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
18. Apply math, science literacy, and communication skills within technical content.

Child Development Services II 200262

Child Development Services II is a continuation of Child Development Services I and is designed for students who wish to further their training in early childhood education. Students gain in-depth work experiences in child care establishments, preschool centers, and other early childhood settings. Leadership development will be provided through the Family, Career and Community Leaders of America (FCCLA).

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate skills in caring for young children in a child care setting.
2. Assess the physical, emotional, cognitive, and social development of children in early childhood settings.
3. Write age-appropriate and effective classroom lesson plans, incorporating the KY Early Childhood Standards.
4. Utilize Kentucky's School Readiness indicators when planning, creating, or evaluating activities with pre-K children.
5. Create and implement art, music, language arts, math, and science activities for young children.
6. Demonstrate positive guidance when working with children.
7. Explore methods of effective communication with parents and guardians of children.
8. Evaluate arrangement of furniture in a child development center for the health, safety, and education of young children.
9. Critique a daily breakfast, lunch, and snack menu from a day care setting.
10. Identify the legal requirements and needs in opening and operating a child development center.
11. Utilize and apply the ITERS-R/ECERS-R (Infant/Toddler Environment Rating Scale—Revised/Early Childhood Environment Rating Scale—Revised) rating systems and subscales to identify characteristics of quality child care programs.
12. Utilize and apply the CLASS assessment scoring system for preschool and Head Start programs.
13. Identify community resources available for use by a child care center.
14. Demonstrate employability and social skills relevant to the career cluster.
15. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
16. Apply math, science literacy, and communication skills within technical content.

Consumer Economics within Social Studies 201015

Consumer Economics is a one credit, interdisciplinary elective course in which students study on personal finance management, income management, choosing financial institutions and services, economics systems, global economy, U.S. government's role in the economy, strategies for savings, investing, and using cash and credit. Students will also investigate large purchases such as home, car, land, and insurance. This course is also designed to promote greater citizenship and career planning. Instruction will focus on social studies Kentucky Academic Standards and the skills assessment on career and technical state/national mandated standards.

This is an interdisciplinary course for Social Studies – Economics credit.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Understand how the United States economy has changed from a rural economy to an industrial economy to a leader in the global economy.
2. Recognize that the U.S. Constitution contains few economic guidelines; therefore, economic policies are determined by elected officials.
3. Analyze how the number and complexity of economic issues have increased as the United States has entered the global economy.
4. Understand that the problem of scarcity (unlimited wants and limited resources) must be addressed by all nations.
5. Recognize that nations deal with scarcity by making choices that have consequences.
6. Analyze how national wealth and consequent trade potential are tied to its resources.
7. Explore how international trade and multinational corporations have led to the emergence of a global economy.
8. Understand that the basic economic problem confronting individuals, societies, and nations is scarcity or the imbalance between unlimited wants and limited resources available to satisfy those wants.
9. Recognize that, as a result of scarcity, individuals, societies, and nations must make choices/decisions, which result in consequences.
10. Analyze economic concepts and understand their nature and relevance to different economic situations.
11. Analyze how individuals and nations deal with the issues of production, distribution, and consumption.
12. Recognize that markets (national, international, global) and economic institutions exist to enable buyers and sellers to exchange goods and services.
13. Recognize that economic systems are created by individuals and societies to achieve broad goals (security, growth, freedom, efficiency, and equity).
14. Apply management practices of individual and family resources including food, clothing, shelter, health care, recreation and transportation.
15. Analyze the impact of technology on the individual's economic resources.
16. Analyze advertisements and personal financial management options.

17. Describe the relationships among the various economic institutions that comprise economics systems such as households, business firms, banks, government agencies, labor unions, and corporations.
18. Analyze the relationship of the environment to family and consumer resources.
19. Analyze factors in developing a long-term financial management plan.
20. Analyze resource consumption for conservation and waste management practices.
21. Demonstrate skills needed for product development, testing, and presentation.
22. Understand that voters influence economic policy and decision making through representatives they elect.
23. Recognize that the United States has a market economy, which is determined by the forces of supply and demand.
24. Explore other economic systems (command, traditional, mixed) to determine the economic forces that control them.
25. Analyze how decisions on the distribution of resources can be made by local, state, and/or federal levels of government.
26. Analyze policies that support consumer rights and responsibilities.
27. Analyze interrelationships between the economic system and consumer actions.
28. Analyze factors that impact consumer advocacy.
29. Understand how economic incentives of private ownership of property, business opportunities, and profit motives have attracted people from many nations to the United States.
30. Recognize that the economy of the United States is a social institution that attempts to meet the needs of the citizenry.
31. Analyze the role culture plays in economic issues of production, distribution, and consumption.
32. Analyze knowledge, skills, and practices required for careers in a global economy.
33. Evaluate the impact of technology on individual and family resources.

Co-op: Consumer and Family Management 200191

Cooperative Education for CTE (Career and Technical Education) courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved pathway course during the same school year that the co-op experience is completed or have already completed the pathway the previous year. Students who participate receive a salary for these experiences, in accordance with local, state, and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Co-op: Culinary Arts 200409

Cooperative Education for CTE (Career and Technical Education) courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved pathway course during the same school year that the co-op experience is completed or have already completed the pathway the previous year. Students who participate receive a salary for these experiences, in accordance with local, state, and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

7. Demonstrate and practice safe work habits at all times.
8. Gain career awareness and the opportunity to test career choices.
9. Receive work experience related to career interests.
10. Integrate classroom studies with work experience.
11. Receive exposure to facilities and equipment unavailable in a classroom setting.
12. Increase employability potential.

Co-op: Early Childhood Education 200210

Cooperative Education for CTE (Career and Technical Education) courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved pathway course during the same school year that the co-op experience is completed or have already completed the pathway the previous year. Students who participate receive a salary for these experiences, in accordance with local, state, and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Co-op: Fashion and Interior Design 200810

Cooperative Education for CTE (Career and Technical Education) courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved pathway course during the same school year that the co-op experience is completed or have already completed the pathway the previous year. Students who participate receive a salary for these experiences, in accordance with local, state, and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Co-op: Food Science and Dietetics 200491

Cooperative Education for CTE (Career and Technical Education) courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved pathway course during the same school year that the co-op experience is completed or have already completed the pathway the previous year. Students who participate receive a salary for these experiences, in accordance with local, state, and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Co-op: Fundamentals of Teaching 200291

Cooperative Education for CTE (Career and Technical Education) courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved pathway course during the same school year that the co-op experience is completed or have already completed the pathway the previous year. Students who participate receive a salary for these experiences, in accordance with local, state, and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Co-op: Hospitality, Travel, Tourism and Recreation 200690

Cooperative Education for CTE (Career and Technical Education) courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved pathway course during the same school year that the co-op experience is completed or have already completed the pathway the previous year. Students who participate receive a salary for these experiences, in accordance with local, state, and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Culinary Arts I 200411

This advanced course allows students to increase competencies in a variety of food preparation techniques. Emphasis will be placed on food presentation, garnishing, menu planning, and the skills necessary to prepare for a career in the culinary arts profession.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Assess the impact of the hospitality industry on local and state economies.
2. Analyze and revise an employability portfolio.
3. Analyze the effect that career demands have on family life.
4. Research the roles of individuals engaged in culinary services.
5. Apply critical and creative thinking, logical reasoning, and problem solving skills in the field.
6. Demonstrate personal and interpersonal skills that enhance working relationships and obtaining jobs.
7. Use accepted industry terminology and technical information.
8. Practice grooming and dress requirements of the industry.
9. Demonstrate knowledge of quality customer service.
10. Demonstrate table setting and food presentation techniques.
11. Use computer based menu systems to create menu layout and design.
12. Outline steps in establishing an entrepreneurial business such as catering.
13. Analyze cost and evaluate its relationship to profit.
14. Explore entrepreneurial opportunities and develop a marketing plan.
15. Demonstrate use of industry equipment, tools and supplies.
16. Operate and maintain tools and equipment following safety procedures and Occupational Safety and Health Administration (OSHA) requirements.
17. Demonstrate skills in knife, tool and equipment handling.
18. Demonstrate proper weighing and measuring techniques.
19. Practice basic safety including first aid and CPR (cardiopulmonary resuscitation) skills.
20. Demonstrate food handling principles.
21. Practice inventory procedures including first in/first out concept.
22. Examine the applicability of convenience food items.
23. Apply menu-planning principles to develop and modify menus.
24. Demonstrate a variety of cooking methods.
25. Prepare various meets, seafood, and poultry.
26. Prepare various stocks, soups, sauces, and gravies.
27. Prepare various fruits, vegetables, pasta, and breakfast foods.
28. Prepare canapés, appetizers, hor d'oeuvres, and garde manger.
29. Evaluate options when using seasonings and flavorings.
30. Apply principles of food preparation to produce a variety of food products and beverages for quantity cooking for special events.
31. Apply the fundamentals of baking to a variety of products.

32. Prepare a variety of gourmet foods including international cuisine.
33. Assess employment opportunities and preparation requirements.
34. Demonstrate written, verbal, and non-verbal communication skills.
35. Apply time management skills.
36. Practice and implement HACCP (Hazardous Analysis Critical Control Point) concepts.
37. Examine opportunities for acquiring industry certifications.
38. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
39. Apply math, science, English/language arts, and communication skills within technical content.

Culinary Arts II 200412

In this course, students resume progress in pursuing competencies in food production and services. Orientation to the food service industry and development of food preparation skills are reinforced. Food service management functions are introduced. More in-depth information is provided and higher levels of skills are taught. Time is provided for work-based learning opportunities.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Assess importance of global food production and food service technologies.
2. Research the roles and functions of individuals engaged in food production and food service careers.
3. Demonstrate personal and interpersonal skills that enhance working relationships and obtaining jobs.
4. Demonstrate use of current technology required by industry.
5. Practice culinary skills through work-based learning opportunities.
6. Demonstrate knowledge of quality customer service.
7. Outline steps in establishing an entrepreneurial business such as catering.
8. Demonstrate knowledge of cost analysis and its relationship to profit.
9. Demonstrate use of equipment, tools, and supplies required by the industry.
10. Demonstrate knowledge of factors that contribute to food borne illnesses.
11. Practice food service safety and sanitation procedures.
12. Demonstrate proper weighing and measuring techniques.
13. Practice grooming and dress requirements of the industry.
14. Maintain tools and equipment following safety procedures and OSHA (Occupational Safety and Health Administration) requirements.
15. Practice basic safety, first aid, and CPR (cardiopulmonary resuscitation) skills.
16. Use computer-based menu systems to create menu layout and design.
17. Prepare quantities of food and evaluate cooking applications.
18. Prepare quantities of food and evaluate baking applications.
19. Prepare a variety of hot and cold beverages.
20. Practice inventory procedures including first in/first out concept, date markings, and specific record keeping.
21. Distinguish between specific American, English, French, and Russian service including place setting and napkin folding techniques.
22. Analyze roles of employees in the front and back of the house operations.
23. Plan, prepare, and serve a variety of meals and special events such as brunches, receptions, teas, luncheons, and dinner parties.
24. Manage the planning, preparation, service, clean-up, and evaluation of a variety of meals and special events in the role of student manager for in-school events or outside worksite events.

25. Present food proposals or banquet event orders to clients with effective marketing techniques.
26. Design and use garnishing and display techniques to create a food display for various occasions and events.
27. Project profit and loss including labor, food, capital, and other costs.
28. Update employability portfolio.
29. Demonstrate employability and social skills relevant to the career cluster.
30. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
31. Apply math, science, and communication skills within technical content.

Early Lifespan Development 200223

This course addresses the topics of early lifespan development including conception and pregnancy, labor and delivery, infants, toddlers, preschoolers, school-age children, health and safety, and exceptional children. Students will explore career opportunities within the early childhood education industry. Leadership development will be provided through the Family, Career and Community Leaders of America (FCCLA).

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Explain the areas of human growth and development.
2. Recognize the effects of heredity and environment on human growth and development.
3. Describe the stages of human growth and development across the lifespan.
4. Compare and contrast prenatal development during each trimester of pregnancy.
5. Categorize the types, characteristics, and contributing factors of potential birth defects.
6. Characterize the signs, symptoms, and process of giving birth.
7. Identify factors that promote optimum growth and development in the infancy and toddler stages, including physical, social, emotional development and intellectual growth.
8. Identify factors that promote optimum growth and development in the preschool and school-age stages including physical, social, emotional, and intellectual growth.
9. Recommend effective guidance techniques for dealing with inappropriate behavior.
10. Plan and organize developmentally appropriate activities for the preschool and school-age child.
11. Analyze conditions that influence human growth and development.
12. Describe methods of identifying exceptional children.
13. Identify health and safety issues for children.
14. Assess the effects of abuse and neglect on children and families.
15. Research and analyze careers in the Early Childhood Education pathway.
16. Demonstrate employability and social skills relevant to the career cluster.
17. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
18. Apply math, science, and communication skills within technical content.

Entrepreneurship 080310

This course is designed to provide students the skills needed to effectively organize, develop, create, and manage their own business. This course is based on the business and marketing core that includes communication skills, economics, financial analysis, operations, promotion, and selling. The culminating project of the course is the development of a comprehensive business plan. Cooperative education or shadowing experiences may be used to enhance course instruction. DECA, FBLA (Future Business Leaders of America) and/or Family, Career and Community Leaders of America (FCCLA) will be an integral component of course content and leadership development.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
2. Explain career strategies associated with entrepreneurship.
3. Conduct self-assessment to determine entrepreneurial potential.
4. Explain the factors and personality traits that contribute to the success of a small business entrepreneur.
5. Explain the importance of customer service to an entrepreneur.
6. Describe the financial statements needed for a business plan and the purposes of financial planning.
7. Investigate the role of international trade, opportunities of global markets, and the potential of international trade.
8. Describe the legal considerations for starting a business.
9. Formulate a business plan and describe its components, recognizing the many roles of a small business owner.
10. Identify sources of business start-up information.
11. Discuss market analysis to determine target market.
12. Examine the role of management in a successful business, specific management techniques for small business, and management strategies.
13. Analyze the risks and rewards of starting a business.
14. Analyze pricing in the marketing mix, pricing strategies, and the establishment of a pricing strategy.
15. Evaluate types of business ownership.
16. Determine cost of product (breakeven, markup).
17. Explain the nature of overhead and operating expenses.
18. Identify, evaluate, and select sources for financing a business venture.
19. Identify training procedures, hiring policies, and rights and responsibilities of small business employees.
20. Explain the types of promotion.
21. Prepare a promotional budget.

22. Select and analyze computer software and hardware options for small business; examine benefits of organizational membership.
23. Demonstrate technology skills needed in the workplace.
24. Exemplify entrepreneurship decision making through projects and simulations.
25. Identify individual work habits and ethics (individual and team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills) and explain their importance in the work place.
26. Apply math and communication skills within the technical content.

FACS Essentials 200113

This comprehensive course provides an opportunity for acquiring basic life skills and guides students to explore and select specific areas for concentrated study. Emphasis is on family, employability skills, adolescent development, introduction of textiles, interiors and design, financial management, parenting, establishing healthy relationships, creating a foundation for healthy lifestyles, and nutrition.

Recommended Grade Level: 9 – 10

Recommended Credit: 1

Students will:

1. Examine personal values and character traits.
2. Assess personal social skills and integrate an improvement plan.
3. Identify and evaluate some positive and negative influences and consequences of peers on adolescent behavior, including high risk behaviors.
4. Develop personal short-term and long-term SMART goals.
5. Analyze the practical problems faced by families to balance the demands of work and family.
6. Identify physical, psychological, social, economic, technology and health influences on personal wellness.
7. Predict the results of accomplishing or failing to accomplish the developmental tasks of adolescence.
8. Summarize ways of reducing or preventing teen pregnancy.
9. Analyze financial, social, physical and emotional costs of parenthood.
10. Demonstrate wise spending practices such as advertising and comparison shopping.
11. Use the decision making process.
12. Plan a personal budget.
13. Calculate sales tax, price per unit, and sale discounts.
14. Identify individual work habits and ethics (individual and team skills, confidentiality, problem solving, punctuality, self-discipline, communication skills) and explain their importance in the work place.
15. Formulate a culminating assessment using comparison shopping techniques, budgeting practices, and managing resources.
16. Analyze the causes and consequences of diet, exercise, rest and other substance choices on various body systems.
17. Plan, prepare, and evaluate a menu using current Dietary Guidelines for Americans and the USDA MyPlate.
18. Identify proper kitchen equipment and utensils, and demonstrate proper use.
19. Demonstrate and practice knowledge of food service safety and sanitation.
20. Illustrate design elements and principles.
21. Compare and contrast societal housing trends within the United States.
22. Utilize color schemes to create fashion apparel design using technology.
23. Analyze career opportunities in Family and Consumer Sciences career pathways.
24. Demonstrate employability and social skills relevant to each career major and pathway.

25. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
26. Apply math, science, and literacy skills within technical content.

FACS Essentials Health 200161

FACS Essentials Health is a .5 credit, interdisciplinary elective course which can serve as a student's health education requirement. Students gain an understanding of the knowledge, attitudes, skills, and behaviors impacting health lifestyles. This course provides basic principles of individual and family well-being; wellness; nutrition; non communicable diseases; goals, decisions, time management, and stress management; behavioral choices, mental health problems; conflict resolution; body systems and structure; first aid, emergencies and safety; related careers.

Recommended Grade Level: 9 – 10

Recommended Credit: .5

Students will:

1. Describe symptoms, causes, patterns of transmission, prevention, and treatments of communicable diseases such as hepatitis, tuberculosis, STI (sexually transmitted infections) and HIV (Human Immunodeficiency Virus) and non-communicable diseases such as cancer, diabetes, obesity, cardiovascular disease, arthritis, and osteoporosis.
2. Explain the process of human reproduction and development through conception, birth, childhood, adolescence, and adulthood, and explain its impact on an individual's wellbeing.
3. Identify some positive and negative influences of peers on adolescent behavior.
4. Compare causes, symptoms, and treatment of mental and emotional health for individual and family.
5. Evaluate the risks, such as sexually transmitted infections, unwanted pregnancies, HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome), of being sexually active and the strategies for delaying sexual activity including abstinence, using refusal skills, talking with parents, doctors, and counselors.
6. Use the decision-making process.
7. Plan a personal budget.
8. Analyze how responsible use of machinery, motorized vehicles, and firearms reduce the risk of accidents and save lives.
9. Explain proper first aid procedures, CPR (cardiopulmonary resuscitation), and rescue breathing for responding to emergency situations.
10. Develop personal short-term and long-term goals.
11. Identify physical, psychological, social, and health influences on personal wellness and practice social skills such as dining etiquette and social media.
12. Analyze the causes and consequences of diet, exercise, rest, and other substance choices on various body systems.
13. Explain ways to make responsible buying decisions in relation to wants and needs.
14. Plan menus for a day using the Dietary Guidelines for Americans/MyPlate and evaluate a meal for essential nutrients.
15. Analyze advertising techniques that influence a consumer decision.
16. Evaluate financial management practices, including budgeting, banking, savings, investments, and credits.

17. Predict how consumer actions impact the environment.
18. Evaluate food labels and nutritional facts for nutritional content.
19. Evaluate the consequences of high-risk behaviors.
20. Develop a plan to improve social skills.
21. Describe relationship between agencies (public, private and non-profit) and compare services.
22. Compare consumer products and services.
23. Demonstrate employability and social skills relevant to the career cluster.
24. Analyze career pathways in Human Services and Health Sciences.
25. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
26. Apply math, science, and communication skills within technical content.

FACS Leaders at Work 200199

This course is designed to prepare Family and Consumer Sciences students to be innovative and effective leaders in families, future careers, and communities. Students will integrate higher order thinking, communication, leadership, and technical skills to explore family and consumer sciences careers, conduct service learning projects, discover modern social issues relevant to the field, and enhance employability skills to lead the 21st century workforce. Students will be engaged in project-based learning opportunities by developing authentic, real-world and rigorous projects leading to self-discovery, positive social action and career preparation.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 – 1

Students will:

1. Assess individual personality traits and use it to create a professional growth plan.
2. Utilize leadership styles and personality inventories to assign roles and responsibilities.
3. Apply the decision making process effectively.
4. Develop personal and professional goals using the SMART goals template.
5. Model proper communication skills in the workplace.
6. Perform the elements of effective public speaking to convey information to an audience.
7. Discuss how teams can contribute to an organization's effectiveness.
8. Use problem solving techniques to mediate conflicts that occur in the workplace.
9. Analyze the history of Family and Consumer Sciences and its impact on today's society.
10. Explain the historical foundations of Family and Consumer Sciences, its evaluation over time, its mission, and its focus.
11. Analyze career opportunities in each of the FCS (Family and Consumer Sciences) Career Pathways with an emphasis on Family and Consumer Sciences Education.
12. Appraise the importance of Family and Consumer Sciences Education.
13. Defend the need for Family and Consumer Sciences Teachers in public and private settings.
14. Advocate for Family and Consumer Sciences Education.
15. Analyze organizational structures and their components including bylaws, officers, committees, and program of work.
16. Explain the procedures of parliamentary law using Robert's Rules of Order.
17. Demonstrate the use of proper parliamentary procedure skills.
18. Assess the importance of active membership and leadership in professional organizations in terms of growing as a professional and keeping abreast of new information in your field. (Examples: ACTE, KACTE, NATFACS, KATFACS, AAFCS, KAFCS, Family, Career and Community Leaders of America (FCCLA) Alumni and Associates, FCSEA, NEA, KEA, and career pathway related professional organizations.)
19. Correlate the role of service learning with social responsibilities and needs.
20. Collect data to defend the need for a service learning project.
21. Construct professional written communication such as business letters, business emails, cover letter, letter of application, resumes, memos, and other forms of correspondence.
22. Demonstrate appropriate professional etiquette.

23. Understand the importance of an ethical climate in the workplace.
24. Develop a tool to increase time management, planning skills, and organization in the workplace.
25. Justify the value of diversity in the workplace (cultural, socio-economic, ethnicity, disability, gender).
26. Determine impact of social, economic, cultural, and technological forces on employee development and performance through evaluation tools.
27. Practice confidentiality and other workplace policies in work-based learning placements.
28. Integrate new technology trends in the workplace utilizing web 2.0 tools, new software programs and hardware.
29. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
30. Apply math, science, and communication skills within technical content.

Fashion and Interior Design I 200821

This course provides opportunities for students to explore career competencies in the fashion and interior design industry. Students will examine the impact of history, culture, and the environment on current and future trends in the fashion and interior design industries. Students will evaluate elements and principles of design as well as construct fashion and interior design projects that demonstrate comprehension.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Explain personal and societal influences on clothing choice.
2. Summarize the relationship of clothing and housing and environments to behavior.
3. Describe the evolution of fashion from early civilizations to the 21st century.
4. Explain how the fashion industry operates.
5. Explain the role of fashion designers in the apparel industry.
6. Predict factors that affect fashion and interior design trends.
7. Identify elements and principles of design in fashion and interior design.
8. Classify fibers, yarns, and fabrics.
9. Compare and contrast performance characteristics of fibers, yarns, and fabrics.
10. Compare and contrast natural and synthetic fibers.
11. Demonstrate the various types of weaves.
12. Comprehend and follow product care labels.
13. Select appropriate fabric care products.
14. Describe how the family life cycle influences housing needs.
15. Identify the impact of technology on housing choices.
16. Identify housing and furniture styles from various periods.
17. Differentiate types of floor and wall coverings, window treatments, and furniture.
18. Draw furniture arrangements for the social, private, and service zones of a home.
19. Design floor plans and visual presentations.
20. Apply measuring skills to create scale drawings and to determine body measurements.
21. Demonstrate basic sewing machine procedures.
22. Practice safety procedures for operating and caring for industry-related equipment.
23. Evaluate and perform construction techniques for a variety of projects.
24. Select, design, and construct items for self.
25. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
26. Apply math, sciences, and communication skills within technical content.

Fashion and Interior Design II 200825

This course provides opportunities for students to develop career competencies in the fashion and interior design industry. Advanced fiber classification, textile performance, and construction techniques are used for client designs and application as an integral component of this course. Students will implement technology to create visual presentations for clients and the development of an individual digital portfolio.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Develop employability and social skills relevant to the career pathway.
2. Create a professional student digital design portfolio.
3. Research the skills, training, and entrepreneurial opportunities relating to careers in fashion and interior design.
4. Describe job market changes that have resulted from technology and its increased use in a global economy.
5. Illustrate advanced use of elements and principles of design in various projects.
6. Practice safety procedures for operating and caring for industry-related equipment.
7. Compare the properties and performance of fibers and fabrics.
8. Use sketches and illustrations to communicate ideas.
9. Demonstrate the ability to drape on a dress form.
10. Interpret terminology for reading blueprints, floor plans, and patterns.
11. Explain how building codes are used to assure quality and safety in new homes.
12. Design floor plans and visual presentations using technological resources.
13. Evaluate product information and care of textiles, furnishings, technology, and equipment.
14. Utilize computer software for space planning.
15. Identify and compare performance standards of materials and textiles for fashion and interior design.
16. Identify factors which affect the appropriateness of textiles selection to provide quality choices for clients.
17. Select, design, and construct items for others, including special populations.
18. Prepare and modify a budget based upon client needs.
19. Apply knowledge of advanced pattern layouts and cutting for textile items.
20. Identify and perform advanced construction techniques for a variety of projects.
21. Create, present, and critique design plans that address client needs.
22. Demonstrate advanced sewing machine procedures.
23. Execute skills related to specialty equipment procedures such as, but not limited to, sergers and embroidery machines.
24. Construct advanced sewing projects.
25. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.

26. Apply math, science, communication skills, problem solving, and decision making within technical content.

Fashion and Interior Design III 200826

This course provides opportunities for students to apply career competencies and equip students with entrepreneurial skills for the fashion and interior design industry. Students may develop a business plan and operate a student-run enterprise. An emphasis on client-based projects through advanced textile construction, creation of floor plans, and other related fashion and interior design projects are incorporated. Individual digital portfolios will be finalized to document growth and enhancement in the career pathway.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 2

Students will:

1. Apply employability and social skills relevant to the career pathway.
2. Formulate procedures for starting an entrepreneurial business in fashion and interior design.
3. Implement a budget based upon business needs.
4. Explain the concepts of marketing and merchandising.
5. Explain the importance of visual merchandising.
6. Evaluate marketing and promotional methods in the fashion and interior design industries.
7. Create advertising media to influence business promotion.
8. Predict factors that affect fashion and interior design.
9. Practice estimating, ordering, and pricing skills for business needs.
10. Describe the parts of an operating system.
11. Practice safety procedures for operating and caring for industry-related equipment.
12. Apply knowledge of advanced patternmaking.
13. Demonstrate advanced sewing machine procedures.
14. Apply measuring skills to create scale drawings to determine body measurements.
15. Select, design, and construct items for others, including special populations.
16. Create, present, and critique design plans that address client needs.
17. Evaluate and perform advanced construction techniques for a variety of projects to meet client needs.
18. Utilize elements and principles of design in fashion and interiors.
19. Construct advanced apparel alterations and repairs.
20. Demonstrate work experience in the fashion and interiors industry.
21. Design floor plans and visual presentations for client-based projects.
22. Demonstrate and execute skills for advanced equipment procedures such as, but not limited to, sergers, embroidery machines, heat press, software, and vinyl cutter.
23. Finalize a professional digital portfolio.
24. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
25. Apply math, science, and communication skills within technical content.

Foods and Nutrition 200441

This course is designed to assist students in making critical decisions about food, which contributes to health and well-being. Laboratory instruction is included as an application process. Practical problems addressed relate to attitudes toward food, nutrition facts, special health concerns and diets, management of food resources, preparation skills, food safety, sanitation, and careers in nutrition and food service.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Determine how changes in technology have increased food choices.
2. Identify physical, social, cultural and economic influences and trends related to food choices.
3. Explain how digestion turns food into usable nutrients.
4. Propose a balanced meal plan using the Dietary Guidelines for Americans and MyPlate.
5. Examine how personal food choice affects nutrition, personal wellness, and maintaining a healthy weight.
6. Research various eating disorders and identify sources of help.
7. Demonstrate and/or practice basic cooking methods to prepare a variety of foods.
8. Identify and use basic kitchen equipment and tools.
9. Manage a safe, effective, and productive lab while utilizing teamwork.
10. Practice measuring techniques for liquid and dry ingredients.
11. Change yield of recipe.
12. Inspect food labels for nutrition and food additives.
13. Recognize the value of following a shopping plan for food.
14. Calculate the difference in cost and identify variances in nutrition among semi-prepared, fully-prepared convenience meals, fast food or other quick service meals, and home prepared foods.
15. Calculate unit price using comparison shopping methods; compare labels to create a meal plan based on cost and personal nutrition needs.
16. Examine and select convenience foods according to time saved, cost and quality.
17. Identify and practice various types of food presentation techniques.
18. Practice dining etiquette and table set up when eating at a restaurant or in the home.
19. Demonstrate waste disposal and recycling methods.
20. Demonstrate proper safety, sanitation, storage and preparation techniques in handling food from purchase, preparation, cooking, cooling, to reheating.
21. Categorize careers in nutrition and food service according to skill required and type of job.
22. Assess employment opportunities and preparation requirements.
23. Demonstrate employability and social skills relevant to the career cluster.
24. Demonstrate safe, sanitary work habits required by the field.
25. Demonstrate written, verbal and non-verbal communication skills.

26. Demonstrate and practice knowledge of food service safety and sanitation procedures and the factors that contribute to food borne illnesses.
27. Apply time management skills.
28. Demonstrate employability and social skills relevant to the industry.
29. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
30. Apply math, science, and communication skills within technical content.

Fundamentals of Dietetics 200414

This course provides an overview of the dietetics field of work including the study of professional ethics and practices, career training, and credentialing requirements, dietary research, lifespan and community nutrition, counseling and communication, and legislative law related to the field of dietetics and human nutrition. Laboratory instruction and work-based learning opportunities should be provided through the course curriculum.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 2

Students will:

1. Explore career opportunities within the dietetics field.
2. Demonstrate employability and social skills relevant to the dietetics field.
3. Create a portfolio to use when applying for internships and work-based learning opportunities in the dietetics and nutrition industries.
4. Review the functions of the six essential nutrients.
5. Outline the dietary requirements for the six essential nutrients.
6. Analyze nutrient requirements across the lifespan, addressing the diversity of people, culture, and religions.
7. Produce dietary plans for individuals with specific dietary needs.
8. Analyze safety and sanitation practices in retail, institutions, and home including the use of equipment.
9. Identify government agencies that regulate the safety of the food supply.
10. Research laws and regulations related to food safety.
11. Investigate and debate current food trends and policies.
12. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
13. Apply math, science, and communication skills within the technical content.

Internship: Consumer and Family Management 200192

Internship for CTE (Career and Technical Education) courses provides supervised work site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short term basis.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Internship: Culinary Arts 200478

Internship for CTE (Career and Technical Education) courses provides supervised work site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short term basis.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

7. Demonstrate and practice safe work habits at all times.
8. Gain career awareness and the opportunity to test career choices.
9. Receive work experience related to career interests.
10. Integrate classroom studies with work experience.
11. Receive exposure to facilities and equipment unavailable in a classroom setting.
12. Increase employability potential.

Internship: Early Childhood Education 200201

Internship for CTE (Career and Technical Education) courses provides supervised work site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short term basis.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Internship: Fashion and Interior Design 200801

Internship for CTE (Career and Technical Education) courses provides supervised work site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short term basis.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Internship: Food Science and Dietetics 200492

Internship for CTE (Career and Technical Education) courses provides supervised work site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short term basis.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Internship: Fundamentals of Teaching 200292

Internship for CTE (Career and Technical Education) courses provides supervised work site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short term basis.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Internship: Hospitality, Travel, Tourism and Recreation 200601

Internship for CTE (Career and Technical Education) courses provides supervised work site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short term basis.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 3

Students will:

7. Demonstrate and practice safe work habits at all times.
8. Gain career awareness and the opportunity to test career choices.
9. Receive work experience related to career interests.
10. Integrate classroom studies with work experience.
11. Receive exposure to facilities and equipment unavailable in a classroom setting.
12. Increase employability potential.

Middle to Late Lifespan Development 200226

This course addresses the practical problems related to understanding the areas and stages of lifespan development, review effects of heredity and environment on the life stages, meeting the needs of exceptional individuals, promoting optimum growth and development in the middle childhood, adolescent, adulthood, and elderly stages. Careers in human development and adult care services are explored.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Review the areas of human growth and development.
2. Review the effects of heredity and environment on human growth and development.
3. Review the ages and stages of human growth and development across the lifespan.
4. Describe theorists who have influenced lifespan development.
5. Identify factors that promote optimum growth and development in the middle childhood, including physical growth, social, emotional and moral development, and intellectual development.
6. Identify factors that promote optimum growth and development in the adolescent stage, including physical growth, social, emotional and moral development, and intellectual development.
7. Identify factors that promote optimum growth and development in the early adulthood years, including physical growth, social, emotional and moral development, and intellectual development.
8. Identify factors that promote optimum growth and development in the middle adulthood years, including physical growth, social, emotional and moral development, and intellectual development.
9. Identify factors that promote optimum growth and development in the late adulthood years, including physical growth, social, emotional and moral development, and intellectual development.
10. Recommend effective techniques for behavior modification across the lifespan.
11. Develop and implement age-appropriate activities for middle childhood, adolescence, and young/middle/late adulthood.
12. Define options available to assist individuals with exceptional needs.
13. Research information about careers in human development and adult care services.
14. Demonstrate employability and social skills relevant to the career cluster.
15. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
16. Apply math, science, and communication skills within technical content.

Money Skills 201010

This course is designed to prepare students to understand and use sound financial management skills and practices contributing to financial stability, improving the quality of life for individuals and families. Decision-making, problem solving, goal setting, and using technology are integrated throughout the content.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Understand how personal financial decisions are influenced by a person's interpretation of needs and wants and values.
2. Analyze lifestyle conditions which may affect one's financial situation throughout the life cycle.
3. Recognize the importance of career planning, salaries, and benefits to overall financial well-being.
4. Create a spending plan/budget.
5. Demonstrate skills in understanding payroll deductions.
6. Understand economic systems and the role of government agencies as they relate to sound financial management.
7. Understand the levels of financial risk associated with checking accounts, savings and investing.
8. Evaluate financial institutions and the services they provide.
9. Manage checking accounts, savings accounts, and investment accounts.
10. Define and use common terminology associated with savings and investing.
11. Understand interest and the time value of money.
12. Understand the implications of personal bankruptcy.
13. Evaluate the advantages and disadvantages of renting and owning a home.
14. Demonstrate the process of renting and/or purchasing a home.
15. Demonstrate working knowledge of investments appropriate for individuals and families.
16. Demonstrate skills in tax forms preparation.
17. Understand the relationship between risk and insurance.
18. Select homeowners, renters, automobile, health, and life insurance appropriate for individuals and families.
19. Demonstrate skills necessary for leasing and/or purchasing a vehicle.
20. Identify the advantages and disadvantages of each of the types of credit.
21. Analyze credit card offers and statements.
22. Develop the skills necessary to prevent identify theft.
23. Demonstrate skills in wise spending practices (advertising, comparison shopping, warranties, and defective merchandise).
24. Understand the financial tools used to plan for retirement (social security, pensions, individual retirement accounts, Roth IRA, company sponsored retirement programs).
25. Demonstrate the process of requesting and interpreting a credit report.
26. Describe the purpose of a will and other estate planning documents.

27. Demonstrate employability and social skills relevant to the industry.
28. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
29. Apply math, science, and communication skills within technical content.

Money Skills for Math 201011

This course is designed to provide students with math concepts needed in developing sound money management skills which will help to improve the quality of life for individuals and their families. Components of math, decision making and problem solving skills, goal setting and technology will be integral components of the course. A correlation to the math content in the program of studies was used in developing this interdisciplinary course to count as a fourth math credit. Leadership development will be coordinated through Family, Career and Community Leaders of America (FCCLA) student organization.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Understand how personal financial decisions are influenced by a person's interpretation of needs and wants and values.
2. Analyze lifestyle conditions which may affect one's financial situation throughout the life cycle.
3. Recognize the importance of career planning, salaries, and benefits to overall financial well-being.
4. Create a spending plan/budget.
5. Demonstrate skills in understanding payroll deductions.
6. Understand economic systems and the role of government agencies as they relate to sound financial management.
7. Understand the levels of financial risk associated with checking accounts, savings, and investing.
8. Evaluate financial institutions and the services they provide.
9. Manage checking accounts, savings accounts, and investment accounts.
10. Define and use common terminology associated with savings and investing.
11. Understand interest and the time value of money.
12. Understand the implications of personal bankruptcy.
13. Evaluate the advantages and disadvantages of renting and owning a home.
14. Demonstrate the processes of renting or purchasing a home.
15. Demonstrate working knowledge of investments appropriate for individuals and families.
16. Demonstrate skills in tax forms preparation.
17. Understand the relationship between risk and insurance.
18. Select homeowners, renters, automobile, health, and life insurance appropriate for individuals and families.
19. Demonstrate skills necessary for leasing or purchasing a vehicle.
20. Identify the advantages and disadvantages of each of the types of credit.
21. Analyze credit card offers and statements.
22. Develop the skills necessary to prevent identify theft.
23. Demonstrate skills in wise spending practices (advertising, comparison shopping, warranties, and defective merchandise).

24. Understand the financial tools used to plan for retirement (social security, pensions, individual retirement accounts, Roth IRA (Individual Retirement Account), company sponsored retirement programs).
25. Demonstrate the process of requesting and interpreting a credit report.
26. Describe the purpose of a will and other estate planning documents.
27. Demonstrate employability and social skills relevant to the industry.
28. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
29. Apply math, science, and communication skills within technical content.

Nutritional Food Science 200415

Nutritional Food Science is an interdisciplinary course that has a variety of applications to everyday life. The content in this course is directed toward providing students with knowledge of the various concepts and relationships between nutrition and science. Scientific methods are used to conduct laboratory experiments with food, applying both biology and chemistry principles. Students explore career possibilities in the field of food science.

This course may be used as an interdisciplinary course for Life Science credit.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Identify the chemical symbols most often used in food science.
2. Interpret basic science for food science such as composition of matter, atomic structure, chemical formulas and equations, and chemical and physical changes in food.
3. Explore career pathways within nutritional science.
4. Demonstrate employability and social skills relevant to the career cluster.
5. Describe the functions, operations, and maintenance of test laboratory and related equipment and supplies.
6. Analyze the significance of the roles and interrelationships of microorganisms and food as well as benefits and disadvantages of microbial action.
7. Identify the properties of acids and bases.
8. Test the pH of common foods and food ingredients.
9. Determine the function of water in the human body and in food preparation.
10. Identify the properties and composition of lipids, carbohydrates, proteins, vitamins, and minerals and how the body utilizes each.
11. Examine the effect of the breakdown and synthesis of food which are made possible by a large set of protein catalyst called enzymes.
12. Analyze the breakdown of food molecules that enable the cell to store energy in specific chemicals that allow metabolic functions to occur.
13. Interpret why living systems require continuous input of energy to maintain their metabolic equilibrium.
14. Justify the use of additives in specific food items.
15. Formulate a procedure for a good science experiment.
16. Conduct scientific sensory evaluation of food.
17. Examine why chemical bonds of leavening agents contain energy that is released when broken and new compounds are formed.
18. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
19. Apply math, science, and communication skills within technical content.

Nutritional Food Science (Interdisciplinary) 200416

The entire description and all tasks/standards for Nutritional Food Science (Interdisciplinary) may be found in Nutritional Food Science 200415.

Parenting 200173

This course is designed to educate students in parenting and care giving skills that can be applied in a variety of situations. Major topics include the family, roles and responsibilities of parenting, preparing for a family, conception, prenatal and birth, infancy, health and safety, and early childhood education careers. Leadership development will be provided through the Family, Career and community Leaders of America (FCCLA).

Recommended Grade Level: 10 – 12

Recommended Credit: .5 – 1

Students will:

1. Distinguish among family types.
2. Contrast common examples of family crises.
3. Predict how work and family roles are balanced based on values and goals.
4. Analyze parenting roles across the life span.
5. Examine factors to be considered in assessing readiness for parenthood.
6. Identify causes of and solutions for infertility.
7. Recognize that many hereditary and chromosomal effects can be predicted and presented by genetic counseling.
8. Identify the parts and functions of the male and female reproductive system.
9. Describe methods of birth control.
10. Identify the early signs of pregnancy and the tests for confirming pregnancy.
11. Identify adequate prenatal care.
12. Compare and contrast fetal development during each trimester of pregnancy.
13. Analyze factors that contribute to reducing birth defects.
14. Evaluate the preparations expectant parents should make.
15. Describe the birth process.
16. Describe the physical characteristics of the newborn.
17. Recognize the various aspects of routine infant care.
18. Recognize areas of infant development.
19. Analyze responsibilities common to parenting and care giving roles.
20. Recognize signs of illness in a child.
21. Determine appropriate treatment of children's accidents or injuries.
22. Identify external support systems that provide services for parents.
23. Investigate the specific jobs or careers in the fields of child care and elder care.
24. Demonstrate employability and social skills relevant to the industry.
25. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
26. Apply math, science, and communication skills within technical content.

Principles of Hospitality 200610

This course is designed for students interested in careers in the hospitality industry. The instruction includes career awareness in the areas of recreation, travel and tourism, hotel and motel, and the restaurant industries. This course is based on the family and consumer sciences core that includes communication skills, economics, food and beverage operations, promotion, selling, and product and service management.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Describe the evolution and current trends in the hospitality industry.
2. Identify and describe major types of businesses found in the hospitality industry.
3. Describe social, environmental, economic, and business factors related to the hospitality industry.
4. Develop customer-service skills, employee/employer relations, and other interpersonal skills.
5. Identify advantages and disadvantages of working in the hospitality industry.
6. Explain the impact of meetings, conventions, and conferences on the economy.
7. Illustrate the service delivery system of a full-service hotel and make an oral presentation.
8. Utilize safety and sanitation practices as applied to the industry.
9. Plan management operations for a special event that involves all aspects of hospitality careers in the travel tourism arena.
10. Apply basic skills in food and catering services.
11. Describe the types of promotional strategies and media used in the hospitality industry.
12. Identify the concept of marketing mix and market segmentation as it relates to the hospitality industry.
13. Research career opportunities, job responsibilities, and employment requirements in the hospitality industry.
14. Identify individuals work habits and ethics including individual and team skills, confidentiality, problem solving, punctuality, self-discipline, and communication skills. Explain their importance in the work place.
15. Utilize computers and electronic equipment, business software, web software, and other kinds of technology to collect, organize, and communicate information and ideas.
16. Utilize activities of Family, Career and Community Leaders of America (FCCLA) as an integral component of course content and leadership development.
17. Apply math and communication skills within the technical content.

Principles of Teaching 331020

This course provides opportunities for students with an interest in teaching to develop skills, strategies, and techniques used for instruction at various grade levels for a diverse population of student learners. Instruction addresses the principles and procedures for promoting the physical, emotional, social, and intellectual development of children, adolescents and developmentally appropriate practices in educational settings. Students will gain work experience in classrooms with certified teachers as part of their course work. Other components include the development of a four-year post-secondary plan, KTIP (Kentucky Teacher Internship Program) and PGES (Professional Growth and Effectiveness System) requirements, Kentucky Code of Ethics, and educational pedagogy. Leadership experiences will be provided through various extra and co-curricular student organizations.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 2

Students will:

1. Analyze the characteristics of an effective teacher.
2. Evaluate proper classroom management strategies.
3. Analyze challenges related to teaching and how teachers meet them.
4. Identify the qualities of teacher professionalism and leadership.
5. Describe the requirements to become a teacher in the state of Kentucky.
6. Introduce the Kentucky Teacher Standards and the Kentucky Code of Ethics.
7. Summarize the history of American education and how educational opportunities have evolved.
8. Compare and contrast various structures of education systems.
9. Explain how public schools are governed and funded.
10. Prioritize current education trends and issues such as Every Student Succeeds Act.
11. Describe societal challenges in education today such as changing family patterns, cultures of schools, and risky teen behavior.
12. Explore diversity and its implications in the classroom including diverse teaching methods.
13. Describe the components of a lesson plan.
14. Compare and contrast various examples of lesson plans.
15. Explore various teaching strategies.
16. Research the current educational content standards for Kentucky.
17. Distinguish between formative and summative assessment.
18. Analyze different methods used to assess student learning.
19. Design an instructional unit.
20. Create a lesson plan using strategies and methods taught in class.
21. Teach a lesson using the lesson plan developed by the student.
22. Research effective use of technology in education.
23. Recommend a plan for integrating technology into the everyday classroom.
24. Observe, interact, and reflect on teaching and learning within classrooms.
25. Complete a portfolio that demonstrates knowledge of the teaching profession.

26. Develop a four-year post-secondary plan.
27. Identify career opportunities for educators.
28. Identify the benefits of participation in professional associations for both students and teachers.
29. Utilize activities of various extra and co-curricular organizations as an integral component of course content and leadership development such as Family, Career and Community Leaders of America (FCCLA) or Educators' Rising.
30. Apply reading and communication skills within technical content.
31. Demonstrate employability and social skills relevant to the career cluster.

Relationships 200171

This course assists students to develop self-understanding, understanding of others, interpersonal skills, awareness of other's needs, and physical, mental, and emotional wellness. Family life education comprises a portion of this course including dating and married relationships. Preparations for and the achievement of a successful marriage are emphasized.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 – 1

Students will:

1. Relate self-concept to the fulfillment of one's personal needs.
2. Propose ways to fulfill basic human needs.
3. Examine the importance of a positive self-image.
4. Identify ways of developing positive character traits.
5. Examine the effects of culture, stereotyping, and prejudices on relationships.
6. Evaluate the significance of family and its impact on the well-being of individuals and society.
7. Contrast characteristics of functional and dysfunctional families.
8. Assess the impact of types of abuse and determine methods of prevention.
9. Recommend ways of resolving conflicts.
10. Identify the characteristics of good mental health.
11. Recommend ways to improve intergenerational relationships.
12. Explain the need to respect property rights of others.
13. Demonstrate etiquette skills used as an individual, family member, and wage earner.
14. Predict how work and family roles are balanced based on values and goals.
15. Examine the impact of role models on one's life.
16. Practice using refusal skills to resist peer pressure.
17. Examine one's relationship with friends.
18. Compare the characteristics of an ideal date to those of an ideal mate.
19. Compare the similarities and differences of infatuation, sexual gratification, and mature love.
20. Explain how premarital sexual intimacy could adversely affect one's entire life.
21. Describe presentation, treatment, and the physical effect of sexually transmitted diseases.
22. Predict problems unique to single working parents.
23. Analyze the traits of a long term, successful marriage.
24. Distinguish between real and ideal expectations in marriage.
25. Analyze career opportunities concerned with relationships of individual and families.
26. Apply critical thinking and ethical criteria to evaluate interpersonal relationships.
27. Demonstrate employability and social skills relevant to the industry.
28. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
29. Apply math, science, and communication skills within technical content.

Specialized Services in Hospitality 200641

This course is designed to provide training in specialized services within the hospitality field. Job and career opportunities will be explored. Instruction will include skill development and practice. Shadowing and work experiences will be included in a variety of commercial establishments such as hotels, motels, restaurants, local convention bureaus, and tourism centers.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Research jobs and careers related to the hospitality, travel, tourism, and recreation industries.
2. Identify education and training requirements in specialized services.
3. Demonstrate strategies and skills in planning and scheduling specialized event activities such as receptions and weddings.
4. Practice use of safe chemicals and procedures in specialized services.
5. Examine how various departments in a public establishment, such as a hotel or a restaurant, maintain a close working relationship.
6. Demonstrate acceptable guest relations and service skills.
7. Analyze strategies in time management relating to specialized services jobs.
8. Participate in work-based experiences in hospitality areas.
9. Apply sanitation procedures for a clean and safe environment.
10. Demonstrate appropriate laundering processes.
11. Demonstrate organizing and maintaining an efficient housekeeping operation.
12. Demonstrate effective communication skills.
13. Develop procedures for handling external and internal emergencies.
14. Plan programs for recreation and leisure.
15. Demonstrate employability and social skills relevant to the industry.
16. Utilize activities of the Family, Career and Community Leaders of America (FCCLA) student organization as an integral component of course content and leadership development.
17. Apply math, science, and communication skills within technical content.

HEALTH SCIENCE

HEALTH SCIENCE CAREER PATHWAYS

Allied Health CIP 51.0000.01

This pathway is a general, introductory, undifferentiated, or joint pathway in health services occupations that prepares individuals for either entry into specialized training programs or for a variety of concentrations in the allied health area. Includes instruction in the basic sciences, research and clinical procedures, and aspects of the subject matter related to various health occupations.

BEST PRACTICE COURSES

Complete (3) three credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 170501 Allied Health Core Skills

Choose (1) one credit from the following:

- 170167 Body Structures and Functions **OR** 302631 Anatomy
- 170169 Medical Math (.5 or 1 credit)
- 170301 Essentials of Sports Medicine
- 170302 Applied Sports Medicine
- 170550 Internship: Allied Health

Dental Assisting CIP 51.0601.01

This pathway prepares individuals to provide patient care, take dental radiographs (x-ray photographs), prepare patients and equipment for dental procedures, and discharge office administrative functions under the supervision of dentists and dental hygienists. It includes instruction in medical recordkeeping, general office duties, reception and patient intake, scheduling, equipment maintenance and sterilization, basic radiography, pre- and post-operative patient care and instruction, chairside assisting, taking tooth and mouth impressions, and supervised practice.

BEST PRACTICE COURSES

Complete (3) three credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 170552 Internship: Dental Assistant

Choose (1) one credit from the following:

- 170167 Body Structures and Functions **OR** 302631 Anatomy
- 170169 Medical Math (.5 or 1 credit)
- 170501 Allied Health Core Skills
- 170550 Internship: Allied Health

EKG Technology/Technician CIP 51.0902.01

This pathway prepares individuals, under the supervision of physicians and nurses, to administer EKG (Electrocardiogram) and ECG (Electrocardiogram) diagnostic examinations and report results to the treatment team. Includes instruction in basic anatomy and physiology, the cardiovascular system, medical terminology, cardiovascular medications and effects, patient care, EKG (Electrocardiogram) and ECG (Electrocardiogram) administration, equipment operation and maintenance, interpretation of cardiac rhythm, patient record management, and professional standards and ethics.

BEST PRACTICE COURSES

Complete (3) three credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 170555 EKG Technician

Choose (1) credit from the following:

- 170167 Body Structures and Functions **OR** 302631 Anatomy
- 170169 Medical Math (.5 or 1 credit)
- 170550 Internship: Allied Health

Emergency Medical Technician CIP 51.0904.01

This pathway prepares individuals, under the remote supervision of physicians, to recognize, assess, and manage medical emergencies in prehospital settings and to supervise ambulance personnel. Includes instruction in basic, intermediate, and advanced EMT procedures; emergency surgical procedures; medical triage; rescue operations; crisis scene management and personnel supervision; equipment operation and maintenance; patient stabilization, monitoring, and care; drug administration; identification and preliminary diagnosis of diseases and injuries; communication and computer operations; basic anatomy, physiology, pathology, and toxicology; and professional standards and regulations.

This pathway requires an agreement with the Kentucky Board of Emergency Medical Services.

BEST PRACTICE COURSES

Complete (4) four credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 461022 Emergency Medical Technician (EMT)
- 461023 EMS Training

Medical Administrative Assisting CIP 51.0710.00

This pathway prepares individuals, under the supervision of office managers and other professionals, to perform routine administrative duties in a medical, clinical, or health care facility/system office environment. Includes instruction in general office skills, data processing, office equipment operation, principles of medical record-keeping and business regulations, medical/clinical office procedures, and communications skills.

BEST PRACTICE COURSES

Complete (4) four credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 170920 Medical Office Procedures
- 170922 Internship: Medical Administrative Assistant

Patient Care Technician CIP 51.1614.00

This pathway prepares individuals for admission to a professional program in nursing. This pathway focuses on caring for patients in an acute care setting.

BEST PRACTICE COURSES

Complete (3) three credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 170502 Acute Care Basic Skills

Choose (1) one credit from the following:

- 170167 Body Structures and Functions **OR** 302631 Anatomy
- 170169 Medical Math (.5 or 1 credit)
- 170601 Co-op (Nursing)
- 170550 Internship: Allied Health

Pharmacy Technician CIP 51.0805.01

This pathway prepares individuals, under the supervision of pharmacists, to prepare medications, provide medications and related assistance to patients, and manage pharmacy clinical and business operations. Includes instruction in medical and pharmaceutical terminology, principles of pharmacology and pharmaceutics, drug identification, pharmacy laboratory procedures, prescription interpretation, patient communication and education, safety procedures, record-keeping, measurement and testing techniques, pharmacy business operations, prescription preparation, logistics and dispensing operations, and applicable standards and regulations.

BEST PRACTICE COURSES

Complete (3) credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 170558 Pharmacy Technician

Choose (1) credit from the following:

- 170167 Body Structures and Functions **OR** 302631 Anatomy
- 170169 Medical Math (.5 or 1 credit)
- 170501 Allied Health Core Skills
- 170614 Pharmacological and Other Therapeutic Modalities
- 170550 Internship: Allied Health

Phlebotomy Technician CIP 51.1009.01

This pathway prepares individuals, under the supervision of physicians and other health care professionals, to draw blood samples from patients using a variety of intrusive procedures. Includes instruction in basic vascular anatomy and physiology, blood physiology, skin puncture techniques, venipuncture, venous specimen collection and handling, safety and sanitation procedures, and applicable standards and regulations.

BEST PRACTICE COURSES

Complete (3) three credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 170567 Medical Laboratory Aide (Phlebotomist)

Choose (1) one credit from the following:

- 170167 Body Structures and Functions **OR** 302631 Anatomy
- 170169 Medical Math (.5 or 1 credit)
- 170501 Allied Health Core Skills
- 170550 Internship: Allied Health

PLTW Biomedical Sciences CIP 26.0102.00

This pathway focuses on the integrative scientific study of biological issues related to health and medicine, or a program in one or more of the biomedical sciences that is undifferentiated as to title. Includes instruction in any of the basic medical sciences at the research level; biological science research in biomedical facilities; and general studies encompassing a variety of the biomedical disciplines.

Project Lead the Way (PLTW) courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Complete (4) four credits:

- 170701 Principles of Biomedical Science
- 170702 Human Body Systems
- 170703 Medical Interventions
- 170704 Biomedical Innovations

Pre-Nursing CIP 51.2699.01

This pathway prepares individuals for admission to a professional program in nursing. This pathway focuses on caring for residents in a long-term care facility.

BEST PRACTICE COURSES

Complete (3) three credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures (.5 credit) **AND** 170131 Medical Terminology (.5 or 1 credit)
- 170631 Medicaid Nurse Aide

Choose (1) one credit from the following:

- 170167 Body Structures and Functions **OR** 302631 Anatomy (Science course)
- 170169 Medical Math (.5 or 1 credit)
- 170601 Co-op (Nursing)
- 170550 Internship: Allied Health

Veterinary Assistant CIP 51.0808.00

This pathway prepares individuals, under the supervision of veterinarians, veterinary technicians, laboratory animal specialists, and zoological professionals, to provide patient management, care, and clinical procedures assistance as well as owner communication. Includes instruction in animal nursing care, animal health and nutrition, animal handling, clinical pathology, radiology, surgical assisting, clinical laboratory procedures, office administration skills, patient and owner management, and applicable standards and regulations.

This program follows National Association of Veterinary Technicians in America (NAVTA) guidelines and offers students the opportunity for national certification as an approved Veterinary Assistant.

BEST PRACTICE COURSES

Complete (4) four credits:

- 170801 Principles of Veterinary Assisting
- 170802 Veterinary Assisting Skills
- 170803 Advanced Veterinary Assisting Skills
- 170804 Veterinary Assisting Internship

HEALTH SCIENCE COURSES

Acute Care Basic Skills 170502

This course introduces students to basic health care skills. It prepares individuals to perform routine nursing-related services to patients in an acute care setting under the training and supervision of an approved registered nurse. Certification is available upon successful completion of National Healthcare Association (NHA) Patient Care Technician exam. This course is designed for students not enrolled in the Medicaid Nurse Aide program. This course is taught by a registered nurse.

Prerequisites: Principles of Health Science 170111 **AND** Medical Terminology 170131 **AND** Emergency Procedures 170141

Recommended Grade Level: 12

Recommended Credit: 1 – 2

Students will:

1. This course follows the NHA Certified Patient Care Technician/Assistant (CPCT/A) detailed test plan.

Advanced Veterinary Assisting Skills 170803

Students will build on previously mastered animal handling skills and develop advanced skills for work in a veterinary hospital.

According to industry standards, students must successfully complete each course with a 75% or better in order to advance in the program.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the digestive system.
2. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the nervous system.
3. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the immune system.
4. Differentiate between prescription and over-the-counter pharmaceuticals.
5. Demonstrate knowledge of legal issues involving drugs in the workplace.
6. Recognize general types and groups of drugs.
7. Demonstrate knowledge of pharmaceutical terminology.
8. Interpret a prescription and fill it using proper labeling, terminology, and calculations, including expiration dates.
9. Hand pill a dog and a cat.
10. Administer oral liquid medication.
11. Provide care and maintenance of nursing equipment.
12. Set up for fecal floatation.
13. Set up for a fecal smear.
14. Set up for a gross exam of feces.
15. Reconstitute vaccines and demonstrate knowledge of vaccine protocols.
16. Describe possible routes and methods of drug and vaccine administration.
17. Record basic physiological observations in a medical record.
18. Monitor and restrain patients for fluid therapy.
19. Apply and remove bandages to healthy animals.
20. Demonstrate knowledge of small animal nutritional requirements including dry matter basis calculations.
21. Prepare prescription diets and normal food for a patient.
22. Demonstrate knowledge of nosocomial infections and how to prevent them.
23. Recognize common CFA (Cat Fanciers Association) cat breeds.
24. Demonstrate knowledge of pet food labeling standards, dry matter basis calculations, and the differences between pet food products.

Allied Health Core Skills 170501

Allied Health Core Skills is designed to provide knowledge, concepts and psychomotor skills necessary for gainful employment as an entry-level health care worker. Assisting students in selecting a career major, classroom instruction and educational objectives are combined with learning experiences, observations, and a work-based learning opportunity such as internship, shadowing, or clinical rotation. This course is designed for students not enrolled in the Medicaid Nurse Aide program or the Patient Care Technician program.

Prerequisites: Principles of Health Science 170111 **AND** Medical Terminology 170131 **AND** Emergency Procedures 170141

Recommended Grade Level: 11 – 12

Recommended Credit: .5 – 1

Students will:

1. Develop and practice effective oral and written communication skills.
2. Understand the roles and responsibilities of individual members of the health care team.
3. Prepare supplies, equipment, and client for procedures according to facility protocol.
4. Use accepted ethical practices with respect to cultural, social, and ethnic differences.
5. Discuss legal responsibilities, limitations, and the implications of actions within the health care delivery setting.
6. Examine how key systems relate to the services performed and affect the quality of client care.
7. Present injury or illness through safe work practices and following health and safety policies and procedures.
8. Demonstrate professional etiquette and responsibility.
9. Demonstrate knowledge of applicable laws, statutes, or regulations in the career major area.
10. Demonstrate performance skills as outlined on approved internship competency list.
11. Assess client health status according to respective professional standards and report results to treatment team.
12. Demonstrate the effective use of time management skills.
13. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
14. Use information technology applications as appropriate to health care specialties.
15. Integrate literacy and numeracy concepts and processes across all curricular units.
16. Demonstrate employability and social skills relevant to health careers.
17. Explore individual health care careers.
18. Demonstrate skills related to specific health professions.

Applied Sports Medicine 170302

This course emphasizes the prevention, assessment, and care for injuries and illness to the physically active including the components of exercise science, anatomy, and principles of safety under the supervision of an approved licensed athletic trainer. Subject matter also includes legal issues, acute care skills, nutrition, human performance, taping and wrapping, therapeutic modalities, and application of sports medicine concepts.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Understand anatomy and physiology.
2. Define and explain sports medicine related medical terms.
3. Understand structure and function of the musculoskeletal system.
4. Identify members of a sports medicine team.
5. Recognize and implement acute care skills.
6. Complete basic first aid and CPR (cardiopulmonary resuscitation) training.
7. Assess vital signs.
8. Demonstrate management of acute injuries.
9. Investigate the principles of an exercise program.
10. Understand nutrition and weight management.
11. Explore mechanisms of injury.
12. Demonstrate management strategies for injury.
13. Explore special considerations in athletics.
14. Research metabolic and related disorders.
15. Investigate special needs in human performance.
16. Understand rehabilitation and reconditioning.
17. Understand therapeutic modalities.
18. Demonstrate therapeutic exercises.
19. Explore psychological response to injuries.
20. Identify assessment and evaluation techniques of athletic injuries.
21. Perform subjective assessment.
22. Explore objective assessment techniques.
23. Investigate diagnostic testing.
24. Prophylactic taping and bracing.
25. Describe the use of braces and other equipment.
26. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
27. Use information technology applications as appropriate to health care specialties.
28. Integrate literacy and numeracy concepts and processes across all curricular units.
29. Demonstrate employability and social skills relevant to health careers.

Biomedical Innovation 170704

This capstone course gives student teams the opportunity to work with a mentor, identify a science research topic, conduct research, write a scientific paper, and defend team conclusions and recommendations to a panel of outside reviewers. Each team will have one or more mentors from the scientific and/or medical community guiding their scientific research. This course may be combined with the capstone course from the pre-engineering pathway, allowing students from both pathways to work together to engineer a product that could impact healthcare.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Body Structures and Functions 170167

Body Structures and Functions is designed to provide knowledge of the structure and function of the human body with an emphasis on normalcy. The interactions of all body systems in maintaining homeostasis will promote an understanding of the basic human needs necessary for health maintenance. Academic knowledge from life science core content as it relates to the human body will be included. Laboratory activities should be a part of the course when appropriate.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Describe the basic structures and functions of cells, tissues, organs, and each body system as they relate to homeostasis.
2. Compare relationships among cells, tissues, organs, and systems.
3. Explain body planes, directional terms, quadrants, and cavities.
4. Analyze the interdependence of the body systems as they relate to wellness, disease, disorders, therapies, and care rehabilitation.
5. Analyze body system changes in light of diseases, disorders, and wellness.
6. Compare the aging process among the body systems.
7. Discuss and explain the interrelationships and pathophysiology behind specific illness affecting each body system.
8. Integrate literacy and numeracy concepts and processes across all curricular units.

Co-op (Nursing) 170601

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screening. These may include but are not limited to drug screens, TB (tuberculin) skin test, and immunization certificates.

Prerequisites: Principles of Health Science 170111 **AND** Medical Terminology 170131 **AND** Emergency Procedures 170141

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Development of Care Giver Role 170611

This course provides an introduction to nursing and the nursing process as related to client activities of daily living across the life span, opportunity to develop and practice psychomotor skills related to health assessment, promotion, maintenance, and illness prevention.

Prerequisites: Current CPR (cardiopulmonary resuscitation) card for Health Care Provider and successful completion of a Medicaid Nurse Aide

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 2

Students will:

1. Use basic health care measures that maintain, promote, and restore optimal health and wellness.
2. Use the nursing process as the method of problem solving in response to client needs.
3. Demonstrate basic physical assessment techniques.
4. Respond to assistive needs of individuals with functional alterations throughout the life span.
5. Exhibit safe and caring behaviors when providing nursing care.
6. Identify situations where client advocacy is indicated.
7. Develop a beginning awareness of self as a care provider.
8. Effectively use selected technological devices that impact client care in the health care setting.
9. Identify situations beyond one's knowledge and experience and seek appropriate assistance.
10. Give a brief history of persons involved with the early development of microbiology.
11. Describe the infectious process and the etiologic agents.
12. Explain the various body defenses against infection including immune response.
13. Define and list the differences between normal flora and pathogenic organisms affecting the body.
14. Explain the control of microbe growth and standard precautions (OSHA [Occupational Safety and Health Administration] requirements) necessary for a safe work environment for the health care provider.
15. Interview an individual recognizing subjective and objective data.
16. Identify a nursing diagnosis on a care plan.
17. Write goals using proper format.
18. Identify nursing actions on a care plan.
19. Discuss principles of documentation in small groups.
20. Present a sample of documentation of nursing care.
21. Perform an admission, transfer, and discharge.
22. Assist with a physical examination.
23. Plan a family menu for one day with consideration to nutritional and economic needs.
24. Plan a two-day meal for individuals through each stage of the life cycle.

25. Demonstrate the techniques in physical assessment including inspection auscultation, percussion, and palpation.
26. Perform vital signs.
27. Perform coughing and deep breathing exercises.
28. Auscultate the chest breath sounds.
29. Identify normal and abnormal breath sounds.
30. Obtain diet history of an individual.
31. List criteria used in assessing metabolic needs of diverse groups.
32. Feed individuals according to age and/or specific needs.
33. Weigh and measure individuals.
34. Perform blood glucose test.
35. Assist with use of a bedpan and urinal.
36. Diaper an infant.
37. Collect urine specimen, routine and clean-catch.
38. Calculate and record I and O.
39. Apply urine collection devices, infants and external catheters.
40. Assess bowel sounds.
41. Identify methods of promoting safety across the life span.
42. Obtain various cultures from patients including throat, wound, stool, and urine.
43. Perform proper gloving to prevent spread of infection.
44. Perform concurrent cleaning of patient's room.
45. Discuss in pre- and post-conference, various isolation technique precautions.
46. Demonstrate standard precautions.
47. Discuss, in small groups, community resources and support systems available to promote and maintain psychosocial needs of the individual and ways of reaching self-actualization.
48. Demonstrate safe transporting of a patient in a wheelchair including up and down ramps and on and off elevators.

EKG Technician 170555

This course provides experience related to the student's education objectives in the area of EKG (Electrocardiogram) technician. Upon successful completion of the course, students may be eligible to take the EKG (Electrocardiogram) Technician Certification examination. It is best practice for students to participate in a work-based learning opportunity during this course. Students will be required to follow program and agency requirements for attendance and health screenings. These may include but are not limited to: drug screens, TB (tuberculin) skin test, and immunization certificates.

Prerequisites: Principles of Health Science 170111 **AND** Medical Terminology 170131 **AND** Emergency Procedures 170141

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Calculate a patient's heart rate from the EKG (Electrocardiogram) tracing (6-second method, R to R, sequencing).
2. Identify artifacts from the tracing (wandering baseline, somatic, electrical).
3. Resolve artifacts from the tracing (wandering baseline, somatic, electrical).
4. Record an EKG (Electrocardiogram) lead on a patient (3-lead, 5-lead, and 12-lead).
5. Verify the leads recorded on an EKG (Electrocardiogram).
6. Upload a completed EKG (Electrocardiogram) to a patient's electronic medical record.
7. Mount a completed EKG (Electrocardiogram) for a patient's chart.
8. Measure a patient's heart rhythm from the EKG (Electrocardiogram) tracing.
9. Inspect the waveforms of a cardiac cycle for symmetry, direction, and amplitude (P waves, QRS Complexes, ST segments, T waves).
10. Measure a patient's heart conduction from the EKG (electrocardiogram) tracing (PR-interval (PRI), QRS duration, QT-interval).
11. Identify the major classifications of arrhythmias from the EKG (Electrocardiogram) tracing (sinus, atrial, ventricular, and junctional).
12. Identify the major variances to waveforms related to ischemia, injury, or infarction.
13. Respond to potentially life threatening arrhythmias.
14. Verify EKG (Electrocardiogram) machine paper speed (25mm, 50 mm).
15. Verify EKG (Electrocardiogram) machine sensitivity (h, 1, 2).
16. Maintain EKG (Electrocardiogram) equipment and the work environment.
17. Recognize pacemaker spikes on an EKG (Electrocardiogram) trace.
18. Prepare the patient for EKG (Electrocardiogram) monitoring, Holter monitoring, stress testing, and telemetry monitoring (patient history, cardiac medications, patient positioning).
19. Apply electrodes on patients for EKG (Electrocardiogram), Holter monitoring, stress testing, telemetry, pediatric patients, and patients with special considerations (right sided heart, posterior chest, amputations).
20. Respond to signs and symptoms of cardiopulmonary compromise.

21. Adhere to HIPAA (Health Insurance Portability and Accountability Act) regulations regarding Protected Health Information (PHI).
22. Monitor patient condition during stress testing.
23. Respond to complications during stress testing.
24. Verify patient understanding of Holter monitor procedures.
25. Obtain patient vital signs (heart rate, respirations, temperature, blood pressure, pulse oximetry).
26. Identify the structures of the heart on an illustration and describe their function.
27. Trace the flow of blood through the pulmonary and systemic circulatory systems on an illustration.
28. Describe the electrophysiology of the heart and relate the events of the cardiac conduction to the electrocardiogram.
29. Outline the process of electrocardiography.
30. Explain the purpose of measuring the standard 12-lead electrocardiogram.
31. List standards of calibrating and providing general maintenance of an electrocardiograph.
32. Explain the method and rationale for measuring the EKG (Electrocardiogram)/ECG (Electrocardiogram) in the exercising patient including safety hazards.
33. Evaluate the electrocardiogram for cardiac rate, rhythm, and the presence or absence of ectopic beats.
34. Recognize PAC's, atrial fibrillation, atrial flutter, PVC's, ventricular tachycardia, and ventricular fibrillation.
35. Recognize and describe the actions of various common cardiovascular agents.
36. Discuss arrhythmias and identify how to interpret those of the sinoatrial mode, sinus tachycardia, sinus arrest, and sinus bradycardia.
37. Discuss first-degree and second-degree AV block and explain how they can be identified on the ECG (Electrocardiogram)/EKG (Electrocardiogram).
38. Explain the difference between right and left bundle branch blocks and briefly define how each can be identified on an ECG (Electrocardiogram)/EKG (Electrocardiogram).
39. Discuss the role of the ECG (Electrocardiogram)/EKG (Electrocardiogram) technician as it relates to patient care and recording of the ECG (Electrocardiogram).
40. Identify and describe the various types of equipment and supplies used in monitoring and recording electrocardiograms.
41. Perform basic lead placement on the adult, pediatric, and neonatal patient.
42. Prepare and position patient for testing.
43. Attach electrodes to the patient's chest, arms, and legs, connect electrodes to leads from the EKG (Electrocardiogram) machine, and operate the machine to obtain a reading.
44. Explain testing procedures to patient to obtain cooperation and reduce anxiety.
45. Monitor patients' blood pressure and heart rate using EKG (Electrocardiogram) equipment during diagnostic and therapeutic procedures to notify the physician if something appears wrong.
46. Monitor patient's comfort and safety during tests, alerting physicians to abnormalities or changes in patient responses.
47. Observe gauges, recorder, and video screens of data analysis system during imaging of cardiovascular system.
48. Adjust equipment and controls according to physician's orders or established protocol.
49. Check, test, and maintain cardiology equipment.

50. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
51. Use information technology applications as appropriate to health care specialties.
52. Integrate literacy and numeracy concepts and processes across all curricular units.
53. Demonstrate employability and social skills relevant to health careers.

Emergency Medical Technician (EMT) 461022

This basic Emergency Medical Technician Course covers all knowledge aspects of trauma care as outlined by national standards, created by federal guidelines, considered to be the responsibilities of ambulance operations. Training involves typical anatomy and physiology; patient assessment; care for respiratory and cardiac emergencies; control of bleeding; application of dressing and bandages; treatment for traumatic shock; care of fractures, dislocation, sprains and strains; medical emergencies; emergency child birth; burns and heat emergencies; environmental emergencies; principles of vehicle rescue; transportation of patients and general operations of ambulance systems.

This pathway requires an agreement with the Kentucky Board of Emergency Medical Services.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Identify the human systems, including anatomy, physiology, and an introduction and practice in patient assessment.
2. Identify the basic mechanics of respiration; signs of airway obstruction and respiratory arrest; maintaining an open airway; pulmonary resuscitation; variations for children and infants; and special conditions for the laryngectomies.
3. Identify the basics of circulation, signs and symptoms of cardiac arrest.
4. Demonstrate the procedure of cardiopulmonary resuscitation by one rescuer and two rescuers.
5. Demonstrate the use of airways, suction equipment, resuscitation devices, and airway adjuncts.
6. Describe signs, symptoms, and prevention of shock and treatment of shock.
7. Identify signs of internal and external bleeding and demonstrate procedures of bleeding control.
8. Identify indicators and contra indicators relative to the use of pneumatic anti-shock garments and provide for practice in their application.
9. Identify the physiology of the skin and types of wounds. Demonstrate the care of wounds.
10. Demonstrate and practice the application of dressings and bandages.
11. Identify anatomy and physiology of musculoskeletal systems and definitions and types of fractures and dislocations.
12. Demonstrate the techniques of care for fractures and dislocations, sprains, and strains.
13. Identify the signs and symptoms of injury to the pelvis and hip and demonstrate the emergency care for pelvic and hip injury.
14. Identify anatomy and physiology of the nervous systems; signs and symptoms of spinal fractures; general rules of care for patients with spinal injuries; signs of skull fractures; care for skull brain, face and neck injuries; and practice immobilization using extrication collars and splint devices.

15. Identify functions of the abdomen, genitalia, and the chest including techniques of care of these areas.
16. Describe the signs and symptoms of poisoning, bites, and stings; heart attack; stroke and dyspnea; and the care for medical emergencies relative to these conditions.
17. Describe the signs and symptoms and techniques of care for diabetic, abdominal distress, and substance abuse emergencies including seizures.
18. Identify relative anatomy, physiology, and emergency care for emergency childbirth.
19. Identify components of assessing the newborn, care for premature infants, and pediatric emergencies.
20. Identify the degree and classification of burns and care for each classification.
21. Recognize and identify hazardous materials and precautionary procedures.
22. Identify signs and symptoms and correct techniques for heat emergencies, hypothermia, and water related emergencies.
23. Describe considerations when dealing with infants, children, elderly, and disadvantaged patients.
24. Identify procedures to deal with abnormal behavior and substance abuse patients.
25. Describe dealing with death and near death situations as an EMT.
26. Identify, demonstrate, and practice the procedures for lifting and transfer of patients.
27. Identify and practice the principles of patient triage.
28. Identify procedures of patient extrication from vehicles.
29. Identify the components of ambulance operations.
30. Identify the components of reports and documents associated with emergency care.
31. Identify the legal aspects of emergency care.
32. Identify communications processes associated with the operations of an emergency medical services system.
33. Identify communicable disease transmission and the universal precautions associated with bloodborne and airborne diseases.
34. Provide for in-hospital observations and training.
35. Provide for field observation of emergency medical care as a member of an ambulance crew.

Emergency Procedures 170141

This course will focus on potential emergency situations. It is designed to promote an understanding of standard precautions necessary for personal and professional health maintenance and infection control. Upon successful completion of the course, the student will demonstrate the necessary skills in First Aid and Cardiopulmonary Resuscitation (CPR) and will be given the opportunity to take the completion examination as outlined by the sponsoring agency.

Recommended Grade Level: 9 – 12

Recommended Credit: .5

Students will:

1. Demonstrate proper emergency rescue and transport procedures.
2. Analyze emergency situations and determine appropriate emergency care.
3. Investigate legal and ethical issues related to emergency procedures.
4. Demonstrate correct use of PPE (Personal Protective Equipment) in relation to standard precautions for prevention or spread of disease.
5. Compose an emergency plan for the home.
6. Assess the physical and mental status of the client.
7. Research and debate issues concerning organ donation.
8. Evaluate data related to the mortality rate of the local community.
9. Identify and locate designated emergency shelters in the community.
10. Compare and contrast emergency procedures used in the media to reality.
11. Inspect the school and/or home for potential safety hazards.
12. Evaluate current health or safety issues in the community.
13. Research current data available on the economic impact of life support systems.
14. Evaluate emergency services and resources available in the community.
15. Demonstrate proficiency in CPR (cardiopulmonary resuscitation), AED, and first aid techniques.
16. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
17. Use information technology applications as appropriate to health care specialties.
18. Integrate literacy and numeracy concepts and processes across all curricular units.
19. Demonstrate employability and social skills relevant to careers.

EMS Training 461023

Training involves typical anatomy and physiology; patient assessment; care for respiratory and cardiac emergencies; control of bleeding, application of dressing and bandages; treatment of traumatic shock; care for fractures, dislocation, sprains, and strains; medical emergencies; emergency childbirth; burns and heat emergencies; environmental emergencies; principles of vehicle rescue; transportation of patient; and general operations of emergency medical services.

This pathway requires an agreement with the Kentucky Board of Emergency Medical Services.

Recommended Grade Level: 9 – 12

Recommended Credit: 1 – 6

Students will:

1. Identify the three (3) major roles and responsibilities of the first responder.
2. Describe the legal aspects of providing emergency care.
3. Identify the human systems including anatomy.
4. Identify the basic mechanics of respiration; signs of airway obstruction and respiratory arrest; maintaining an open airway; pulmonary resuscitation; variations for children and infants; and special consideration for the laryngectomies.
5. Identify comprise of circulation and signs of cardiac arrest.
6. Demonstrate the procedure of cardiopulmonary resuscitation by one rescuer and two rescuers.
7. Demonstrate the use of airway resuscitator devices and airway adjuncts.
8. Describe signs of shock, prevention of shock, and treatment of shock.
9. Identify signs of internal and external bleeding and demonstrate procedures of bleeding control.
10. Identify the physiology of the skin and classify types of bandages.
11. Demonstrate and practice the application of dressings and bandages.
12. Identify anatomy and physiology of musculoskeletal systems and definitions and types of fractures and dislocations.
13. Demonstrate the techniques of care for fractures and dislocations, sprains, and strains.
14. Identify the signs and symptoms of injury to the pelvis and hip, and demonstrate the emergency care of pelvic and hip injury.
15. Identify anatomy and physiology of the nervous system; signs and symptoms of spinal fractures, general rules of care for patients with spinal injuries; signs of skull fractures; care for skull, brain, face and neck injuries; and practice immobilization using extrication collars.
16. Identify functions of the abdomen, genitalia, and the chest including techniques of care for these areas.
17. Describe the signs and symptoms of poisoning, bites, and medical emergencies relative to these conditions.
18. Describe the signs and symptoms and techniques of care for diabetic, abdominal distress and substance above emergencies including seizures.
19. Identify relative anatomy, physiology, and emergency care for emergency childbirth.

20. Identify the methods to employ for assessing the newborn, care for premature infants, and pediatric emergencies.
21. Identify the degree and classification of burns and care for each classification.
22. Recognize and identify hazardous materials and precautionary procedures.
23. Identify signs and symptoms and care techniques for heat emergencies, hypothermia, and water related emergencies.
24. Identify procedures to deal with abnormal behavior and substance abuse patients.
25. Describe dealing with death and near death situations as a first responder.
26. Identify, demonstrate, and practice the procedures for lifting and transferring of patients.
27. Identify and practice the principles of patient triage.
28. Identify procedures of patient extrication from vehicles.
29. Identify the components of ambulance operations.
30. Identify the components of reports and documents associated with emergency care.
31. Identify communication processes associated with the operations of an Emergency Medical Services System.
32. Identify communicable disease transmission and the universal precautions associated with bloodborne and airborne pathogens.

Essentials of Sports Medicine 170301

This course prepares individuals to perform routine sports medicine related services for the physically active, under the training and supervision of an approved licensed athletic trainer. The purpose of this course is to give individuals knowledge and skills to prevent, recognize, and provide basic care for injuries and sudden illness.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Understand anatomy and physiology.
2. Define and explain the medical terms related to sports medicine.
3. Understand structure and function of the musculoskeletal systems.
4. Understand structure of related body systems.
5. Explore the fundamental aspects of sports medicine team.
6. Identify members of a sports medicine team.
7. Explore educational requirements of different sports medicine professionals.
8. Identify different career opportunities for sports medicine professionals.
9. Understand licensure requirements of medical professionals.
10. Explore ethical, legal, and professional responsibilities.
11. Recognize and implement professionalism.
12. Examine ethical behavior in health care.
13. Demonstrate legal responsibilities in health care.
14. Recognize and implement acute care skills.
15. Assess vital signs.
16. Demonstrate management of acute injuries.
17. Investigate the principles of exercise programs.
18. Explain the principles of physical conditioning.
19. Understand physical fitness testing and training.
20. Explore how environmental factors affect performance.
21. Differentiate thermal stresses.
22. Investigate severe weather situations.
23. Identify other physical factors related to performance.
24. Explore mechanisms of injury.
25. Identify common injuries.
26. Explore tissue response to injury.
27. Demonstrate management strategies for injury.
28. Explore special considerations in athletics.
29. Demonstrate safety practices for sports medicine.
30. Understand rehabilitation and reconditioning.
31. Understand therapeutic modalities.
32. Identify assessment techniques of athletic injuries.
33. Perform subjective assessment.
34. Explore objective assessment techniques.

35. Investigate diagnostic testing.
36. Prophylactic taping and bracing.
37. Demonstrate lower and upper extremity taping.
38. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
39. Use information technology applications as appropriate to health care specialties.
40. Integrate literacy and numeracy concepts and processes across all curricular units.
41. Demonstrate employability and social skills relevant to health careers.

Health Science Microbiology/Infection Control 170640

This course is designed to promote an understanding of the effects of microorganisms on the human body. The study includes standard precautions necessary for health maintenance and infection control. The focus is on reduction of diseases that interfere with basic human needs.

Recommended Grade Level: 11 – 12

Recommended Credit: .5

Students will:

1. Define terms related to microbiology.
2. Discuss cell structure and taxonomy of prokaryotic/eukaryotic cells and organelles.
3. Explore the diversity and physical characteristics of microorganisms including bacteria, fungi, algae, protozoa, parasites, and viruses.
4. Review basic chemistry concepts.
5. Identify the principles of microbial growth, control and death and actions of microbial control agents.
6. Discuss principles of disease, disease transmission and control, and epidemiology including commonly encountered pathological microorganisms.
7. Identify methods to prevent the spread of communicable diseases.
8. Identify OSHA (Occupational Safety and Health Administration) requirements necessary for a safe work environment for the health care provider.
9. Discuss human defenses against infectious diseases.

Human Body Systems 170702

Students will engage in the study of the processes, structures, and interactions of the human body systems. Important concepts in the course include communication, transport of substances, locomotion, metabolic processes, defense, and protection. The central theme is how the body systems work together to maintain homeostasis and good health. The systems will be studied as "parts of a whole," working together to keep the amazing human machine functioning at an optimal level. Students will design experiments, investigate the structures and functions of body systems, and use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary actions, and respiratory operations. Students will work through interesting real world cases and often play the role of biomedical professionals to solve medical mysteries.

Recommended Grade Level: 10 – 11

Recommended Credit: 1

Internship: Allied Health 170550

The internship provides supervised on-the-job work experience related to the students' education objectives. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screenings. These may include but are not limited to: drug screens, TB (tuberculin) skin test, and immunization certificates.

This course may be repeated to accommodate multiple experiences in a variety of health care settings.

Prerequisites: Principles of Health Science 170111 **AND** Medical Terminology 170131 **AND** Emergency Procedures 170141

Recommended Grade Level: 10 – 12

Recommended Credit: .5 – 1

Students will:

1. Gain career awareness and the opportunity to test career major choices.
2. Name credentialing agencies for careers related to career major.
3. Trace the organizational structure of the career major and affiliating agency.
4. Research the history and rationale of career major specialty.
5. Identify the different specialties in the career major.
6. Review theory related to career pathway.
7. Demonstrate knowledge of applicable laws, statutes, or regulations in the career area.
8. Research common diseases or problems associated with career major.
9. Receive work experience related to the career major prior to graduation.
10. Integrate classroom studies with work experience.
11. Receive exposure to facilities and equipment unavailable in a classroom setting.
12. Increase employability potential after graduation.
13. Demonstrate performance skills related to the career major area.
14. Demonstrate knowledge of first aid and CPR (cardiopulmonary resuscitation) as they relate to the area.
15. Demonstrate professional etiquette and responsibilities.
16. Demonstrate effective communication skills.
17. Practice team building concepts.
18. Demonstrate effective use of time management skills.
19. Incorporate use of related medical terminology and theory related to the career major.
20. Demonstrate correct observation skills.
21. Demonstrate proper use of the telephone, communication system, copier, and fax machine.
22. Recognize and provide environmental personal and patient safety.

Internship: Dental Assistant 170552

This course is designed to assist students with developing skills needed to be successful dental assistants and responsible members of the health care society. The students will develop skills performed by the dental assistant. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screenings. These may include but are not limited to drug screens, TB (tuberculin) skin test, and immunization certificates.

Prerequisites: Principles of Health Science 170111 **AND** Medical Terminology 170131 **AND** Emergency Procedures 170141

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 2

Students will:

1. Use correct dental terminology when describing the teeth and landmarks of the teeth.
2. Name the universal codes for each tooth in the permanent teeth.
3. Provide the current location of each permanent tooth.
4. Identify and describe oral lesions.
5. Demonstrate procedures for performing hard tissue charting and accurately record the findings.
6. Demonstrate process of performing extraoral and intraoral examinations and record the findings.
7. Explain the process of tooth decay and the various stages.
8. List three types of dental delivery systems.
9. Apply the principles of chair side assisting to each specialty area.
10. Define pediatric dentistry and procedures common to this specialty.
11. Identify the role of the dental assistant in pediatric dentistry.
12. Discuss effective management of the pediatric patient in the dental operatory.
13. Describe the design of a dental treatment room.
14. List the type of dental equipment in a dental treatment room and their function.
15. Describe how to prepare a dental treatment room for patient treatment.
16. Describe the positioning of the patient and dental team.
17. Describe the principles of transferring and exchanging instruments.
18. Describe the three parts of a dental hand instrument.
19. List the types of hand cutting instruments and their uses.
20. List the types of restorative instruments and their uses.
21. Describe additional accessory instruments used in dentistry.
22. Describe the use of preset trays and tubs.
23. List instruments and supplies contained in a basic setup.
24. Describe the low speed hand piece.
25. Describe the attachments used on the low speed hand piece.
26. Describe the high speed hand piece and its use.
27. Describe rotary instruments and how they are used.

28. List the parts of a bur.
29. Demonstrate procedures used in moisture control.
30. Demonstrate the grasp and positioning of the dental assistant when using the high volume oral evacuator tip.
31. Demonstrate the use of the air water syringe.
32. Correctly follow tooth selection criteria for sealant placement.
33. Discuss and demonstrate accepted sequence in sealant placement.
34. Process exposed intraoral and extraoral dental radiographs.
35. Clean x-ray processing equipment.
36. Mount and label radiographs.
37. Prepare radiographs for legal requirements, viewing, and filing.
38. Maintain radiographic equipment.
39. Provide patient safety measures and educate patient in radiographic safety.
40. Practice operator safety measures.
41. Monitor personal radiation exposure.
42. Identify principles and functions of extraoral dental.
43. Expose extraoral dental radiographs.
44. Interpret common conditions found on intraoral and extraoral dental radiographs.
45. Mount and label radiographs.
46. Prepare radiographs for legal requirements, viewing, and filing.
47. Select appropriate dental film.
48. Prepare and assist with temporary crowns.
49. Apply pit and fissure sealants.
50. Prepare, mix, transfer, and store restorative materials.
51. Prepare, mix, transfer, and store sedative and palliative materials.
52. Select, manipulate, and store impression materials.
53. Apply OSHA (Occupational Safety and Health Administration) safety measures when using toxic dental materials or irritants.
54. Prepare, mix, transfer, and store impression materials.
55. Select, manipulate, and store gypsum products.
56. Take impressions for study casts.
57. Fabricate and evaluate diagnostic casts.
58. Articulate casts.
59. Fabricate custom impression trays.
60. Apply safety measures when using gypsum materials.
61. Place, carve, and finish amalgam restorations.

Internship: Medical Administrative Assistant 170922

Internship for CTE (Career and Technical Education) courses provides supervised work site experience for high school students who have completed courses leading to a career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. Students receiving pay for intern experience are those participating in an experience that is a semester or longer and have an established employee-employer relationship. A non-paid internship affects those students who participate on a short term basis.

Prerequisites: Principles of Health Science 170111 **AND** Medical Terminology 170131 **AND** Emergency Procedures 170141

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Introduction to Nursing and Health Care System 170610

This course provides a historical overview of current health care including medical economics, ethical and legal parameters, roles and responsibilities of health care team members with an emphasis on reflective nursing practice. Medical terminology, therapeutic communication techniques, concepts of health, health assessment, self-care and basic needs related to ADL (activities of daily living) across the lifespan are explored.

Prerequisites: Current CPR (cardiopulmonary resuscitation) card for Health Care Provider and successful completion of a Medicaid Nurse Aide equivalent course.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Explain the U.S. health care system including delivery systems and the role of health care providers.
2. Explain the history of nursing as it related to current practice.
3. Explain the ethical and legal parameters governing the practice of practical nursing.
4. Use medical terminology accurately and appropriately.
5. Demonstrate the use of effective therapeutic communication techniques.
6. Relate, at a beginning level, activities of daily living to client age and health status to determine care needs.
7. Collect psychosocial and functional information for the assessment of an individual's health status.
8. Provide basic health care information to promote and maintain health.

Leadership Dynamics 170199

This course is designed to assist students with developing skills needed to be successful leaders and responsible members of society. The students will develop personal attributes and social skills necessary for a successful transition into the world of work, and/or further education. Emphasis will be placed on team work, problem solving, critical thinking, oral and written communication, personal development, work ethics, and leadership. It is recommended that the student be a member of the student organization where they will have opportunities to apply the knowledge gained from this course.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 - 1

Students will:

1. Define leadership: compare the types of leadership styles and assess the importance of qualified leaders to the success of organizations.
2. Analyze personal characteristics and qualities of successful leaders; construct a questionnaire and interview a person in a leadership role.
3. Participate in leadership opportunities available in the community.
4. Develop verbal and written communication skills to enhance success in school and in transition to the world of work.
5. Prepare and present an informative, illustrative, or persuasive speech.
6. Participate in public relations activities by speaking, writing, or making presentations to a group.
7. Prepare a press release for publication.
8. Contact, in writing, a guest to attend an organizational meeting.
9. Demonstrate techniques used for proper business/professional etiquette—meeting people, travel, and table etiquette.
10. Serve as host when the guest you invite attends a meeting.
11. Analyze organizational structures and their components including bylaws, officers, committees, and program of work.
12. Identify main components of and compare local, state, and national bylaws.
13. Demonstrate the use of parliamentary skills by conducting or presiding over a meeting
14. List the steps for handling a motion and identify the classes of motions.
15. List the rules of debate.
16. Develop techniques to resolve conflict that arises in the home, school, community, and workplace.
17. Prepare an Employability Skills Portfolio.
18. Collaborate in a team setting using critical thinking and problem solving skills.
19. Participate as an active member of HOSA-Future Health Professionals including local, state, and national events.

Medicaid Nurse Aide 170631

This course is an instructional program that prepares individuals to perform routine nursing-related services to patients in long-term care facilities under the training and supervision of an approved registered nurse. State Registry is available upon successful completion of state written and performance examination. Prior to offering this course, the instructor and health science program must be approved for meeting state requirements set by the Cabinet for Health and Family Services.

Recommended Grade Level: 11 – 12

Recommended Credit: 1 – 2

Students will:

1. Practice good personal hygiene.
2. Maintain good personal health.
3. Exhibit acceptable behavior.
4. Work cooperatively with others.
5. Maintain confidentiality.
6. Observe the Resident's Rights.
7. Identify and report abuse or neglect to appropriate person.
8. Use plan of care to meet resident's needs.
9. Communicate with resident, family, and staff.
10. Assist resident in use of intercom/call system/telephone.
11. Report observations/information to appropriate personnel.
12. Recognize health problems related to the aging process.
13. Recognize needs of the resident with cognitive impairment.
14. Assist with providing recreational activities for the resident.
15. Assist with giving postmortem care.
16. Follow standard precautions and bloodborne pathogens standard.
17. Wash hands aseptically.
18. Provide for environmental safety.
19. Adjust bed and side rails.
20. Assist with application of protective devices.
21. Report unsafe conditions to appropriate person.
22. Assist with care of resident with oxygen.
23. Follow fire and disaster plan.
24. Assist resident who has fallen.
25. Assist resident who has fainted.
26. Assist resident who is having a seizure.
27. Clear the obstructed airway – the conscious adult.
28. Use elevation, direct pressure, and pressure points to control bleeding.
29. Serve meals and collect trays.
30. Recognize diet modifications/restrictions.
31. Check food tray against diet list.
32. Feed or assist resident in eating.

33. Administer after meal care.
34. Record and report intake and output.
35. Give bed bath.
36. Assist resident with the partial bath.
37. Assist resident with tub bath.
38. Assist resident with shower.
39. Make unoccupied (closed) bed.
40. Make occupied bed.
41. Perform or assist in performing oral hygiene for the conscious/unconscious resident.
42. Assist with or shave resident.
43. Give backrub.
44. Give perineal care.
45. Shampoo/groom hair.
46. Give nail care.
47. Assist resident with dressing and undressing.
48. Provide urinary catheter care.
49. Provide care for the urinary incontinent resident.
50. Provide care for the bowel incontinent resident.
51. Assist resident in bladder retraining.
52. Assist resident in bowel retraining.
53. Assist resident in using bedpan/urinal.
54. Assist with enema administration.
55. Collect routine/clean catch urine specimen.
56. Collect stool specimen.
57. Collect sputum specimen.
58. Use good body mechanics.
59. Perform or assist with range of motion exercises.
60. Turn and position the resident in bed.
61. Transfer resident to and from bed/chair.
62. Use a mechanical lift to transfer resident.
63. Apply and use gait belt.
64. Assist resident with standing/walking.
65. Assist resident in using cane/walker.
66. Transport resident by wheelchair.
67. Move resident between stretcher and bed.
68. Assist with admission, in-house transfer, and discharge of resident.
69. Measure and record resident temperature by using oral, auxiliary, rectal and tympanic routes using non-mercury glass/electronic thermometer.
70. Measure and record radial pulse.
71. Measure and record respiration.
72. Measure and record blood pressure.
73. Measure and record height/weight.
74. Assist in prevention of pressure/circulatory ulcers.
75. Apply elastic stockings.
76. Don and doff personal protective equipment.

Human Body Systems 170702

Students will engage in the study of the processes, structures, and interactions of the human body systems. Important concepts in the course include communication, transport of substances, locomotion, metabolic processes, defense, and protection. The central theme is how the body systems work together to maintain homeostasis and good health. The systems will be studied as "parts of a whole," working together to keep the amazing human machine functioning at an optimal level. Students will design experiments, investigate the structures and functions of body systems, and use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary actions, and respiratory operations. Students will work through interesting real world cases and often play the role of biomedical professionals to solve medical mysteries.

Recommended Grade Level: 10 – 11

Recommended Credit: 1

Medical Laboratory Aide (Phlebotomist) 170567

This course consists of a combination of classroom and hands-on experiences related to the student's education objectives in the area of Medical Laboratory Aide/Phlebotomist. Students may be eligible to take the National Healthcareers Association Phlebotomy Tech certification exam upon successfully completing the course. It is best practice for students to participate in a work-based learning experience during this course. Students will be required to follow program and agency requirements for attendance and health screening. These may include but are not limited to: drug screens, TB (tuberculin) skin test, and immunization certificates.

Students must complete a minimum of 30 successful unaided venipuncture collections and 10 successful unaided capillary collections in order to take the National Healthcareers Association certification exam.

Prerequisites: Principles of Health Science 170111 **AND** Medical Terminology 170131 **AND** Emergency Procedures 170141

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Collect, transport, handle, and process blood and urine specimens for analysis.
2. Adhere to all regulations and guidelines outlined by HIPAA (Health Insurance Portability and Accountability Act).
3. Gain career awareness and the opportunity to test career major choices.
4. Name credentialing agencies for careers related to career major.
5. Trace the organizational structure for the career major and affiliating agency.
6. Research the history and rationale of career major specialty.
7. Identify the different specialties in the career major.
8. Demonstrate knowledge of applicable laws, statutes, or regulations in the career areas.
9. Research common diseases or problems associated with career major.
10. Receive work experience related to the Medical Laboratory Aide/Phlebotomist career prior to graduation.
11. Integrate classroom studies with work experience.
12. Receive exposure to facilities and equipment unavailable in a classroom setting.
13. Demonstrate performance skills related to the Medical Laboratory Aide/Phlebotomist career.
14. Demonstrate knowledge of first aid and CPR (cardiopulmonary resuscitation) as they relate to the area.
15. Demonstrate professional etiquette and responsibilities including effective communication skills.
16. Demonstrate effective use of time management and team building skills.
17. Demonstrate correct observation skills.

18. Perform procedures to prevent disease transmission utilizing OSHA (Occupational Safety and Health Administration), CDC (Centers for Disease Control and Prevention) regulations, and universal precautions.
19. Recognize and provide environmental, personal, and patient safety.
20. Follow safety and emergency procedures and explain the use of a safety shower and safety apparel.
21. Demonstrate proper use of communication technology (phone, internet) used in the career area.
22. Receive patients and visitors.
23. Observe, record, and report patient data.
24. Prepare accident and incident reports as necessary.
25. Assist with data entry and billing procedures.
26. Identify supplies and equipment commonly used in lab procedures.
27. Assist with quality control checks of equipment.
28. Log incoming and outgoing specimens.
29. Deliver supplies and lab specimens to designated areas.
30. Prepare specimens for shipment.
31. Maintain lab work surfaces and glassware using proper cleaning and safety procedures.
32. Use appropriate sterilization procedures.
33. Distribute supplies to appropriate laboratory section.
34. Maintain inventory.
35. Maintain, label, and store routine lab chemical solutions.
36. Differentiate between various kinds of collection tubes and anticoagulants.
37. Identify normal values for blood and urine.
38. Name the components of a complete blood count (CBC).
39. Collect fluid and/or tissue specimens using appropriate collection procedures.
40. Explain collection procedures to patients.
41. Match laboratory requisition forms to specimen tubes.
42. Document route of specimens from collection to laboratory analysis and diagnosis.
43. Assist and draw blood from capillaries by dermal puncture, such as heel or finger stick methods.
44. Assist and draw blood from veins by vacuum tube, syringe, or butterfly venipuncture methods.
45. Assist and draw blood from arteries using arterial collection techniques.
46. Dispose of contaminated sharps in accordance with applicable laws, standards, and policies.
47. Dispose of blood or other biohazard fluids or tissues in accordance with applicable laws, standards, and policies.
48. Identify potential hazards in the lab.
49. Obtain a copy of MSDS (Material Safety Data Sheets) for materials used in the lab.
50. Demonstrate procedure for use of the eyewash station.
51. Organize and clean blood-drawing trays, ensuring that all instruments are sterile and all needles, syringes, or related items are of first-time use.
52. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
53. Use information technology applications as appropriate to health care specialties.

54. Integrate literacy and numeracy concepts and processes across all curricular units.
55. Demonstrate employability and social skills relevant to health careers.

Medical Math 170169

This course is designed to focus, utilize, and build on mathematical skills commonly used in all health occupations. Students will use applied techniques, problem-solving, and critical thinking to perform mathematical operations such as computations, ratio and proportion, weights and measurements, and conversions. This course is strongly recommended for all Health Science majors. Successful completion of Algebra I is suggested prior to enrolling in this course. This course may meet the requirements for the fourth elective mathematics credit required for graduation with an allied health or health science major.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 – 1

Students will:

1. Perform fundamental arithmetic operations on whole numbers, fractions, decimals, and percent for accuracy and speed.
2. Understand mathematical procedures and use them appropriately.
3. Accurately calculate oral and parenteral dosages.
4. Relate mathematics to activities in health science and discuss the importance of a thorough understanding of mathematics to a successful career in the health profession.
5. Perform conversions with accuracy interchanging apothecary, metric, and household systems.
6. Analyze and compare over-the-counter medications as to the number of doses and unit price.
7. Observe and record the ways measurement is used in a medical laboratory.
8. Describe and perform steps in dosage calculations of oral and parenteral medications.
9. Describe and perform steps in dosage calculations in pediatric dosage calculations.
10. Describe and perform concepts of IV therapy calculation.
11. Use various types of graphs to interpret and analyze information.
12. Organize information using classification rules and systems such as symbols, abbreviations, and Roman numerals.
13. Estimate values for operations involving decimals and cognitively compute the results.
14. Represent fractions as ratios in simplest form.
15. Represent numbers in scientific notation.
16. Demonstrate knowledge of measurement systems and conversion principles.
17. Perform addition, subtraction, multiplication, and division of signed numbers.
18. Relate words to algebraic expressions.
19. Set up and solve proportions.
20. Find the mean, median, and mode for a group of values.
21. Use the 24-hour clock (military time).
22. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
23. Use information technology applications as appropriate to health care specialties.
24. Integrate literacy and numeracy concepts and processes across all curricular units.
25. Demonstrate employability and social skills relevant to health careers.

Medical Office Procedures 170920

This course provides a working knowledge of the duties required in a medical office. It includes professional and career responsibilities, interpersonal communication, administrative responsibilities, and financial administration.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. List a variety of career possibilities and areas of specialization in medical office careers.
2. Identify and demonstrate good work habits.
3. Apply personal communication skills and techniques.
4. Define and demonstrate appropriate business appearance and image.
5. Prepare a letter of application and resume.
6. Demonstrate and describe proper telephone techniques.
7. Process incoming and outgoing mail.
8. Schedule patient office appointments, hospital admissions, outpatient surgery, and ancillary testing.
9. Assist patients in completing medical forms.
10. Identify the various health care insurance plans, their coverage, and requirements for billing.
11. Complete forms to release patient information.
12. Maintain office equipment and supplies.
13. Identify medicolegal and ethical responsibilities.
14. Discuss the role of cultural, social, and ethnic diversity affecting health care.
15. Demonstrate an understanding of office safety and ergonomics.
16. Prepare professional reports.
17. Make travel arrangements.
18. Perform bookkeeping tasks including check writing, bank statement reconciliation, billing, and collection procedures.
19. File records accurately.
20. Discuss principles of using electronic medical records.
21. Comply with HIPAA (Health Insurance Portability and Accountability Act) rules and regulations.
22. Identify community resources.
23. Identify safety rules applicable to this course and demonstrate appropriate observance of said rules, including but not limited to, trip hazards, electrical cords and outlets, evacuation procedures for emergency situations (including fire, tornado, bomb threat, and earthquake), lockdown procedures for emergency situations, location and contents of first aid kit, and MSDS (Material Safety Data Sheets).
24. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
25. Use information technology applications as appropriate to health care specialties.
26. Integrate literacy and numeracy concepts and processes across all curricular units.

27. Demonstrate employability and social skills relevant to health careers.

Medical Terminology 170131

Medical Terminology is designed to develop a working knowledge of language in all health science major areas. Students acquire word-building skills by learning prefixes, suffixes, roots and abbreviations. Students will learn correct pronunciation, spelling, and application rules. By relating terms to body systems, students identify proper use of words in a medical environment. Knowledge of medical terminology enhances the student's ability to successfully secure employment or pursue advanced education in health care.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 – 1

Students will:

1. Arrange word roots, prefixes, and suffixes to form medical terms.
2. Categorize word parts by body systems.
3. Interpret terms relating to all major body systems.
4. Correlate origin of terms to other languages.
5. Identify medical acronyms, homonyms, and eponyms.
6. Recognize and define plural forms of medical terms.
7. Access resources to enhance understanding of medical terms.
8. Identify and use common medical abbreviations.
9. Relate medical terms to normal anatomy, growth and development, diagnostic procedures, pharmacology, surgery, mental health and medical specialties.
10. Compare the use of medical terms in the media and real-life situations.
11. Pronounce medical terms.
12. Demonstrate employability and social skills relevant to health careers.
13. Use medical terminology within a scope of practice in order to interpret, transcribe, and communicate information, data, and observations.
14. Recognize and define suffixes that denote noun, adjective, and singular and plural forms of medical words.
15. Categorize major prefixes in the following groups: position, number, measurement, negation, direction, and other prefixes.
16. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
17. Use information technology applications as appropriate to health care specialties.
18. Integrate literacy and numeracy concepts and processes across all curricular units.

Pharmacological and Other Therapeutic Modalities 170614

This course provides an introduction to techniques used to administer commonly used drugs; dosage calculations; diagnostic studies and other related medical therapies; legal responsibilities.

Prerequisites: Current CPR (cardiopulmonary resuscitation) card for Health Care Provider and successful completion of Medicaid Nurse Aide Course

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Calculate drug dosages accurately.
2. Identify the fundamental principles related to pharmacology when administering medications.
3. Identify legal and ethical responsibilities of the practical nurse when administering medications.
4. Identify common therapeutic and diagnostic procedures with pharmacological implications.
5. Perform conversions with accuracy interchanging apothecary, metric, and household systems.
6. Perform steps in dosage calculations of oral and parenteral medications.
7. Perform steps in pediatric dosage calculations.
8. Perform IV therapy calculations.
9. Practice interpreting abbreviations and symbols of medication orders.
10. Discuss the significance of the Controlled Substance ACT of 1970.
11. Discuss the legal and ethical nursing responsibilities related to medications.
12. Discuss, in small groups, nurse's role in drug action/interaction.
13. List the "rights of drug administration."
14. List causes of common medication errors.
15. Practice various routes of administering drugs in simulated situations and in the clinical facility.
16. Practice calculating selected drug dosages.

Pharmacy Technician 170558

This course may be completed as an independent study or classroom course during the student's senior year. Material covered will include orientation, federal law, medication review, aseptic techniques, calculations, and pharmacy operations. It is best practice for students to participate in a work-based learning experience at a pharmacy during this course. Upon successful completion of this internship, students may be eligible to take the Pharmacy Technician Certification examination in order to obtain national certification. Students will be required to follow program and agency requirements for attendance and health screenings. These may include but are not limited to: drug screens, TB (tuberculin) skin test, and immunization certificates.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Understand, discuss, and define basic pharmacy terms and definitions.
2. Understand the Pharmacy Technician certification examination structure, time allowed for exam, and broad topic content.
3. Detail the requirements and process needed to maintain certification.
4. Understand federal laws that affect the pharmacy industry.
5. Discuss different laws and legislation that affect the pharmacy industry including when they were enacted and their importance.
6. Discuss the importance of the Controlled Substance Act of 1970.
7. Outline filing procedures, maintain records according to state and federal laws, and drug substitution requirements.
8. Illustrate how a doctor's DEA (Drug Enforcement Administration) Number is determined and its purpose.
9. Discuss storage requirements for Schedule II drugs.
10. Define the four phases of investigational drugs.
11. Define pharmacology including the varied types of drugs, prescription types, medication dosage forms, and medical devices.
12. List drug interactions on the human body's major systems.
13. Review the different types of medication dosages (tablets, caplets, liquids, creams, emulsions).
14. Describe the different types of administration devices for certain medications and dosages.
15. Review drugs which affect the central nervous system, peripheral nervous system, cardiovascular system, and renal system to include drug interactions, mechanism of action, and manufacturer named drugs.
16. Review drugs classified as hormones including drug interactions, mechanism of action, and manufacturer named drugs.
17. Review drugs classified as anti-infectant drugs including drug interactions, mechanism of action, and manufacturer named drugs.

18. Review drugs classified as chemotherapy drugs including drug interactions, mechanism of action, and manufacturer named drugs.
19. Review blood and blood formation drugs including drug interactions, mechanism of action, and manufacturer named drugs.
20. Review vitamins including drug interactions, mechanism of action, and manufacturer named drugs.
21. Practice and demonstrate aseptic techniques.
22. Demonstrate the proper use of various types of syringes.
23. Define the uses of parenteral routes.
24. Identify the four most widely used parenteral routes.
25. Review sterile compounding procedures.
26. Review the uses of various solutions used in the pharmacy including irrigation solutions, parenteral solutions, and TPN (Total Parenteral Nutrition).
27. Examine the safe handling of antineoplastic agents used in the treatment of cancer.
28. List the steps of a parenteral admixture order.
29. Calculate dosages through the aspects of pharmacy mathematics.
30. Convert units of measurement for the metric, avoirdupois, and apothecary systems.
31. Interpret abbreviations and Roman numerals used in prescriptions.
32. Practice the basics of fractions, decimals, and percent as used in pharmacology.
33. Convert Fahrenheit to Centigrade temperatures.
34. Utilize ratio proportion relationships for chemical mixtures used in the pharmacy.
35. Calculate the amount of drug product to dispense or the number of days' supply from a dosage regimen.
36. Determine the flow rate of an IV solution.
37. Calculate powder volume.
38. Review the various pricing methods used in retail pharmacy.
39. Manage inventory controls of the pharmacy business with an overview of insurance claims and "third party" reimbursement.
40. Maintain an accurate patient profile.
41. Detail what should be collected for a proper patient profile.
42. Define key terms used in inventory management.
43. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
44. Use information technology applications as appropriate to health care specialties.
45. Integrate literacy and numeracy concepts and processes across all curricular units.
46. Demonstrate employability and social skills relevant to health careers.

Principles of Biomedical Science 170701

Student work involves the study of human medicine, research processes and an introduction to bioinformatics. Students investigate the human body systems and various health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. A theme through the course is to determine the factors that led to the death of a fictional person. After determining the factors responsible for the death, the students investigate lifestyle choices and medical treatments that might have prolonged the person's life. Key biological concepts including homeostasis, metabolism, inheritance of traits, feedback systems, and defense against disease are embedded in the curriculum. Engineering principles including the design process, feedback loops, fluid dynamics, and the relationship of structure to function are incorporated in the curriculum where appropriate. The course is designed to provide an overview of all the courses in the Biomedical Science program and to lay the scientific foundation necessary for student success in the subsequent courses.

Recommended Grade Level: 9 – 11

Recommended Credit: 1

Principles of Health Science 170111

Principles of Health Science is an orientation and foundation for occupations and functions in any health care profession. The course includes broad health care core standards that specify the knowledge and skills needed by the vast majority of health care workers. The course focuses on exploring health career options, history of health care, ethical and legal responsibilities, leadership development, safety concepts, health care systems and processes, and basic health care industry skills. This introductory course may be a prerequisite for additional courses in the Health Science program.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Analyze and interpret medical milestones, conditions, trends, and issues to develop historical perspectives about the health care industry.
2. Explore the organizational structure of various health care facilities.
3. Observe, analyze, and interpret human behaviors, social groupings, and institutions to better understand people and the relationship among individuals and among groups.
4. Identify how key systems affect services performed and the quality of health care.
5. Describe ethical practices with respect to cultural, social, and ethnic differences within the health care environment.
6. Recognize legal responsibilities, limitations, and the implications of actions within the health care industry and manage professional behavior accordingly (specifically related to HIPAA [Health Insurance Portability and Accountability Act] regulations).
7. Evaluate services, products, and resources available in the community and state in order to make effective consumer decisions.
8. Follow health and safety policies and procedures to prevent injury or illness through safe work practices.
9. Understand the roles and responsibilities of the health care team and interact effectively with all team members.
10. Explore Maslows' Hierarchy of Needs.
11. Recognize an acceptable Code of Conduct for a health care worker.
12. Use strategies for choosing and preparing for a career in the health care industry.
13. Apply methods of giving and obtaining information to communicate effectively, both orally and in writing.
14. Demonstrate skills and work habits that lead to success in future schooling and work.
15. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
16. Use information technology applications as appropriate to health care specialties.
17. Integrate literacy and numeracy concepts and processes across all curricular units.
18. Demonstrate key employability skills (interviewing, writing resumes, and completing applications) needed for further education or employment.

Principles of Veterinary Assisting 170801

Students will explore careers in veterinary medicine, demonstrate knowledge of safety issues in the veterinary field as well as develop core skills for handling large and small animals.

According to industry standards, students must successfully complete each course with a 75% or better in order to advance in the program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Interpret the attendance, discipline, and grading standards for the school.
2. Demonstrate knowledge of the school's layout, resources, and evacuation procedures.
3. Demonstrate knowledge of the program standards, objectives, dress code, and safety guidelines.
4. Identify the course grading and internship policies.
5. Demonstrate knowledge of OSHA (Occupational Safety and Health Administration) and DEA (Drug Enforcement Administration) regulations for work in a veterinary facility.
6. Describe the roles and responsibilities of different careers in veterinary medicine.
7. Understand the human-animal bond.
8. Demonstrate professional appearance and language in the workplace.
9. Demonstrate appropriate use of electronic communication in the workplace.
10. Demonstrate knowledge of safety precautions with storing, handling, and disposing of biological and therapeutic agents, pesticides, and hazardous waste.
11. Recognize common zoonotic hazards and how to safely handle animals with zoonotic diseases.
12. Describe isolation procedures and identify when isolation is appropriate.
13. Demonstrate knowledge of chemical hazards and how to safely handle common chemicals in the veterinary hospital.
14. Demonstrate knowledge of proper disposal of hazardous medical waste.
15. Demonstrate knowledge of anatomical terms, physiology, and disease processes of basic cell structure.
16. Demonstrate knowledge of anatomical terms, physiology, and disease processes of basic tissue structure.
17. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the integumentary system.
18. Demonstrate knowledge of common species terms.
19. Clean and disinfect a kennel or cage.
20. Remove an animal from an enclosure, weigh animal, and record weight in medical record.
21. Walk a dog on a slip leash in a controlled manner.
22. Place a halter on a horse and lead it in a controlled manner.
23. Identify normal and abnormal animal behavior.
24. Take an animal's vital signs and record in medical record.

25. Brush a dog or cat using correct grooming tool, including removal of mats.
26. Groom a horse and pick out hooves.
27. Trim a dog's nails.
28. Trim a cat's nails.
29. Demonstrate proper use of clippers and clipper blades.
30. Maintain clippers and clipper blades.
31. Dip a patient.
32. Bathe a patient.
33. Express anal glands using the external method.
34. Clean normal ears.
35. Identify the parts of a medical record.
36. Create a medical record for a new patient and file it alphabetically.
37. Take a patient history and record it in a medical record.
38. Follow intake and discharge procedures for a patient using release and discharge forms.
39. Answer the phone in a professional manner, make an appointment, determine an emergency, and schedule accurately.
40. Follow legal requirements for the transfer of a medical record.
41. Schedule an appointment using computer appointment book.
42. Bill a client for a procedure using veterinary software.
43. Organize and maintain inventory.
44. Prepare a rabies certificate following state regulations.
45. Prepare a health certificate following national regulations.
46. Describe common exam room procedures to a client.
47. Write a business letter.
48. Restrain a dog in sternal, lateral, and ventrodorsal recumbency.
49. Restrain a cat in sternal, lateral, and ventrodorsal recumbency.
50. Restrain a dog for jugular venipuncture.
51. Restrain a dog for cephalic venipuncture.
52. Restrain a dog for saphenous venipuncture.
53. Restrain a cat for jugular venipuncture.
54. Restrain a cat for cephalic venipuncture.
55. Restrain a cat for femoral venipuncture.
56. Place a commercial and leash muzzle on a dog.
57. Place a commercial muzzle on a cat.
58. Utilize a catch pole.
59. Apply an Elizabethan collar to an animal.

Special Topics in Allied Health 170591

Special Topics in Allied Health is an expanded course offering the study of current world health-related issues. Topics may vary at the discretion of the instructor with the approval of the Kentucky health science consultant.

Recommended Grade Level: 10 – 12

Recommended Credit: .5 – 1

Students will:

1. Adhere to all regulations and guidelines outlined by HIPAA (Health Insurance Portability and Accountability Act).
2. Tasks will vary based on the topic covered.
3. Research current health-related issues.
4. Investigate employment opportunities and responsibilities of health care workers.
5. Develop work habits necessary for individual maturity and job competence.
6. Create a plan for productive time management.
7. Interpret instructional manuals.
8. Discuss articles from professional journals.
9. Formulate a plan for post-secondary education.
10. Prepare a written and oral culminating report based on experiences in the health science program.
11. Utilize activities of HOSA-Future Health Professionals as an integral component of course content, skills application, and leadership development.
12. Use information technology applications as appropriate to health care specialties.
13. Integrate literacy and numeracy concepts and processes across all curricular units.
14. Demonstrate employability and social skills relevant to health careers.

Veterinary Assisting Internship 170804

Students will develop problem solving skills and demonstrate workplace applications of skills with the Veterinary Assisting Internship.

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the endocrine system.
2. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the reproductive system.
3. Demonstrate knowledge of common veterinary abbreviations and terms.
4. Demonstrate career application of skills and knowledge by completing a veterinary assistant internship in the veterinary industry for a total of 180 hours of contact time.
5. Demonstrate knowledge of the veterinary industry by completing the Level 4 Design Project.

Veterinary Assisting Skills 170802

Students will build on previously mastered animal handling skills and develop specific skills in radiology and surgical assisting for work in a veterinary hospital.

According to industry standards, students must successfully complete each course with a 75% or better in order to advance in the program.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the renal system.
2. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the nervous system.
3. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the musculoskeletal system.
4. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the circulatory system.
5. Demonstrate knowledge of anatomical terms, physiology, and disease processes of the respiratory system.
6. Identify processes and procedures of euthanasia.
7. Explain the equipment needed for a necropsy and proper disposal of a deceased animal.
8. Prepare for and clean up after an exam room appointment.
9. Determine an animal's body condition score.
10. Evaluate an animal's mucous membrane color and hydration as well as capillary refill time.
11. Write business letters and professional electronic communications to clients.
12. Demonstrate appropriate use of electronic communications in the workplace.
13. Sex a cat.
14. Approximate the age of a dog or cat from its dentition.
15. Approximate the age of a horse from its dentition.
16. Identify common ectoparasites.
17. Recognize common AKC (American Kennel Club) dog breeds.
18. Prepare a blood smear and stain it.
19. Prepare a PCV (Packed Cell Volume).
20. Prepare a total protein.
21. Prepare a blood sample for a laboratory.
22. Set up supplies for a serum serology test.
23. Collect a midstream urine sample.
24. Determine physical properties of urine including color and clarity.
25. Use an in-house analyzer for blood analysis.
26. Explain how to handle rabies suspects and handle samples safely.
27. Assist in the preparation of various specimen staining techniques.

28. Demonstrate knowledge of safety procedures for work with radiation.
29. Demonstrate knowledge of the use of a radiology log.
30. Set up for a radiograph.
31. Assist with positioning of animal for a radiograph or ultrasound.
32. Identify directional terms used in veterinary radiology.
33. Demonstrate knowledge of automatic, manual, and digital film developing techniques.
34. Demonstrate knowledge of proper care for radiology equipment.
35. Label, file, and store film and radiographs.
36. Know safety techniques for handling processing chemicals.
37. Maintain a surgery logbook.
38. Evaluate situations and apply aseptic technique.
39. Assist in the pre-anesthetic process.
40. Assist in pre-surgical preparation and induction.
41. Assist with the positioning of surgical patients.
42. Clip and prep a surgical site.
43. Provide post-operative care for a surgical patient.
44. Prepare and open sterile cloth wrapped item while maintaining asepsis.
45. Prepare and open sterile paper wrapped item while maintaining asepsis.
46. Clean surgical instruments.
47. Identify surgical instruments and prepare an instrument pack.
48. Prepare a drape pack, a paper pack, and a gown pack.
49. Use a steam autoclave to sterilize packs.
50. Maintain a steam autoclave.
51. Demonstrate knowledge of gas sterilization techniques.
52. Identify different materials and types of sutures.
53. Explain common surgical procedures.
54. Maintain the surgical suite.
55. Monitor and restrain patients for fluid therapy and record observations.

INFORMATION TECHNOLOGY

INFORMATION TECHNOLOGY PATHWAYS

Computer Programming CIP11.0201.01

The Computer Programming pathway courses will prepare students to design and create apps, as well as troubleshoot the latest programming languages used in industry. It is suggested that students complete the pathway with the four following courses: Computer Literacy, Computational Thinking, along with targeted courses for specific programming language(s) or Project-Based Programming as capstones. Upon completion of this career pathway, students will be prepared for an entry level position in the IT field or continue their education in computer programming.

BEST PRACTICE COURSES

Complete (2) two credits:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 110251 Computational Thinking

Choose (2) two credits from the following:

- 110201 Introduction to Programming
- 110202 C++ I
- 110216 C++ II
- 110205 JAVA Programming I
- 110206 JAVA Programming II
- 110207 Visual Basic I
- 110208 Visual Basic II: Creating Desktop Applications
- 110809 JavaScript
- 110218 PHP I
- 110219 PHP II
- 110214 C# I
- 110215 C# II
- 110220 Python I
- 110221 Python II
- 110217 Perl I
- 110821 App Development with Swift
- 110226 Project-Based Programming
- 110711 AP Computer Science Principles
- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

Computer Programming Blended Hybrid CIP 11.0201.02

The Computer Programming Blended Hybrid pathway (formerly the Appalachian Technology Institute (ATI) Computer Programming Pilot pathway) courses will use a blended online environment and delivery system. Students have the opportunity to be exposed to courses from the computer science, computer programming, and web design/application pathways. Upon completion of this career pathway, students will be prepared for an entry level position in the IT field, to continue their education in computer programming, or to become an entrepreneur in the region.

BEST PRACTICE COURSES

Complete (1) one credit:

- 110201 Introduction to Programming

Choose (2) two credits from the following:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 110220 Python I
- 110711 AP Computer Science Principles
- 110801 Web Page Development

Choose (1) one credit from the following:

- 110701 AP Computer Science A
- 110918 Information Technology Co-Op
- 110919 Information Technology Internship

Computer Science CIP 11.0701.01

The Computer Science Pathway courses focus on computer theory, computing problems and solutions, and design of computer systems and user-interfaces. The coursework will include instruction in the principles of computational science, computer development and programming and applications to a variety of end use situations.

BEST PRACTICE COURSES

Choose (1) one credit from the following:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 110710 Introduction to Computer Science

Choose (1-2) one - two credits from the following:

- 110251 Computational Thinking
- 110205 JAVA Programming I
- 110711 AP Computer Science Principles

Choose (1-2) one - two credits from the following:

- 110701 AP Computer Science A
- 110226 Project-Based Programming
- 110202 C++ I
- 110809 JavaScript
- 110206 JAVA Programming II
- 110218 PHP I
- 110214 C# I
- 110220 Python I
- 110217 Perl I
- 110230 Cybersecurity (PLTW)
- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

Cyber Engineering CIP 14.0902.00

The Cyber Engineering pathway is a blend of programming, cyber security, and hardware engineering disciplines. Students will learn to research, design, develop, and test computer systems and components. The National Integrated Cyber Education Research Center (NICERC) courses in the pathway use project-driven, application-based curricula that engage students at the secondary level. The curriculum provides the teacher with a rigorous program that showcases a systems-level understanding of real-world applications of science, technology, engineering, and mathematics. The courses provide a hands-on, context based approach that empowers teachers to prepare students to become the next generation of engineers and cyber professionals. The coursework explores topics such as robotics, electricity, and security concerns in today's digital society.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 110222 Cyber Literacy I (NICERC)
- 110223 Cyber Literacy II (NICERC)
- 110224 Cyber Science (NICERC)
- 110225 Computer Science (NICERC)
- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

Digital Design and Game Development CIP 36.0113.00

The Digital Design and Game Development pathway courses provide students with a thorough understanding of techniques for designing advances 3D games and simulations. The courses will cover 2D and 3D graphics, animation, character development, texturing, scripting, program design and coding, and game setup using state-of-the-art software development tools. Completing students will have developed the skills necessary to create 3D graphics and applications that can be used for games and simulations.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 113605 Game Design and Development Principles
- 113601 Introduction to Digital Game Graphics
- 113603 Advanced 3D Game Development
- 113602 Advanced Game Development and Publishing
- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

Choose (4) four credits from the following:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 113605 Game Design and Development Principles
- 113601 Introduction to Digital Game Graphics
- 110201 Introduction to Programming
- 110251 Computational Thinking
- 113602 Advanced Game Development and Publishing

Informatics CIP 11.0802.00

Students will apply software systems and industry software to acquire, collect, store and communicate data in meaningful ways to clients. Students will manage projects, work in teams, think critically, solve problems and propose solutions to design problems. Further, they will learn to apply literacy, mathematics and science concepts and use technology to effectively solve real-world challenging problems. Through project-based learning, students will explore the future of informatics and learn those habits of behavior and mind unique to professionals in the field. Informatics leverages technology, date and communication by instilling in a new generation the knowledge, imagination and flexibility to tackle complex issues successfully in a data-rich digital world. It is the process of designing systems that take raw data and convert it into new knowledge that can be applied to any field while considering the impact on individuals, organizations and society. **THE SOUTHERN REGION EDUCATION BOARD (SREB) INFORMATICS COURSES MUST BE TAUGHT IN THE FOUR COURSE SEQUENCE AND REQUIRE AN AGREEMENT BETWEEN SREB AND THE LOCAL SCHOOLS DISTRICT. EACH COURSE REQUIRES TEACHER SUMMER TRAINING BEFORE IMPLEMENTATION.**

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 111001 Computer, Networks, and Databases
- 111002 Design for the Digital World
- 111003 Databases in the Cloud
- 111004 Developing a Cloud Presence
- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

Information Support and Services CIP 47.0104.01

The Information Support and Services pathway focuses on the design of computing systems. The courses include instruction in the principles of computer hardware and software components, algorithms, databases, and telecommunications.

BEST PRACTICE COURSES

Complete (3) three credits:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 110101 Computer Hardware and Software Maintenances
- 110102 Help Desk Operations

Choose (1) one credit from the following:

- 110302 Management of Support Services
- 110917 Internet Technologies
- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

Network Administration CIP 11.0901.01

The Network Administration pathway courses will help students learn new administration support skills or upgrade existing computer information systems skills. Students will be able to properly install networking software on an appropriately sized computer; configure the software for a simple server environment and connect it correctly to a physical network; manage a simple networking environment; effectively troubleshoot problems; adding new users and attending to security concerns; and work within the ethical/professional parameters in the field of network administration.

BEST PRACTICE COURSES

Complete (1) one credit:

- 110110 Computer Literacy **OR** 060112 Digital Literacy

Choose (3-4) three - four credits from the following for the Network Administration Path:

- 110101 Computer Hardware and Software Maintenance
- 110251 Computational Thinking
- 110901 Introduction to Networking Concepts (non-vendor)
- 110917 Internet Technologies

Choose (3-4) three - four credits from the following for the Cisco Path:

- 110902 Network Fundamentals/Cisco I
- 110903 Routing Protocols and Concepts/Cisco II
- 110904 LAN Switching and Wireless/Scaling Networks/Cisco III
- 110905 Accessing the WAN/Connecting Networks/Cisco IV

Complete (3) three credits for the MCSA Path:

- 110101 Computer Hardware and Software Maintenance
- 110901 Introduction to Networking Concepts (non-vendor)
- 110913 Microsoft Client/Server Configuration

Optional (1) one credit:

- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

Network Security CIP 11.1003.00

The Network Security pathway will help students be able to properly design and install and wired LAN, including all network devices, physically connect servers and desktop computers, properly design and install a wireless LAN including all network devices, and make physical LAN connections for servers and desktop computers, integrate the Wireless LAN with wired LAN and work within the ethical and professional parameters in the Computer Networking profession. Students will be a team member, learn new network administration support skills and upgrade existing computer information system skills.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 110101 Computer Hardware or Software Maintenance
- 110901 Introduction to Networking Concepts (non-vendor)
- 110912 Security Fundamentals
- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

Web Development/Administration CIP 11.0801.01

The Web Development/Administration pathway involves creating, designing, and producing interactive multimedia products and services. This will include development of digitally-generated or computer-enhanced media, and the adherence to web standards, as used in business, training, communications and marketing. Organizations of all types and sizes use digital media, web pages, and websites to communicate with existing and potential customers, to track transactions, and to collaborate with colleagues. This pathway will prepare students to enter the workforce ready to participate as leaders in a broad range of careers and further their education.

BEST PRACTICE COURSES

Complete (3) three credits:

- 110110 Computer Literacy **OR** 060112 Digital Literacy
- 110801 Web Page Development
- 110804 Web Site Design and Production

Choose (1) one credit from the following:

- 110213 Design for the Internet
- 110917 Internet Technologies
- 110251 Computational Thinking
- 110918 Information Technology Co-Op **OR** 110919 Information Technology Internship

INFORMATION TECHNOLOGY COURSES

Accessing the WAN/Connecting Networks/Cisco IV 110905

This course covers WAN technologies and network services required by converged applications in a complex network. Instruction enables students to understand the selection criteria of network devices and WAN technologies to meet network requirements. Helps students learn how to configure and troubleshoot network devices and resolve common issues with data link protocols. Helps students to develop the knowledge and skills needed to implement IPSec and virtual private network (VPN) operations in a complex network.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Describe different WAN technologies and their benefits.
2. Describe the operations and benefits of virtual private networks (VPNs) and tunneling.
3. Configure and troubleshoot serial connections.
4. Configure and troubleshoot broadband connections.
5. Configure and troubleshoot IPSec tunneling operations.
6. Demonstrate network operations using syslog, SNMP, and networking tools.
7. Design Borderless networks.
8. Design Data centers and virtualization.
9. Design Collaboration technology and solutions.

Advanced 3D Game Development 113603

This course emphasizes creating 3D graphics using one or more state-of-the-art software packages. Instruction provides students with a thorough understanding of techniques for designing advanced 3D games and simulations. Courses will cover 2D and 3D graphics, animation, character development, texturing, rigging, scripting and game setup using state-of-the-art software development tools.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Compare and contrast modeling methodologies (for example, polygons, NURBS, splines).
2. Explain the applications of low polygon and high polygon construction.
3. Construct and manipulate polygonal objects.
4. Applying texturing/surfacing/shading to models and normal mapping.
5. Identify UVW mapping coordinates.
6. Explain how lighting and shading affects form and surface.
7. Implement basic lighting concepts for ambient and artificial light.
8. Describe the difference between forward and inverse kinematics.
9. Examine the process of particle creation and their application to game design.
10. Create a parent/child hierarchy.
11. Create a joint/bone chain.
12. Apply and adjust weight maps.
13. Create atmospheric effects.
14. Demonstrate the use of constraints to animate objects.
15. Apply various animation techniques (for example, pose-to-pose, straight ahead).
16. Adjust the dynamic properties (for example, gravity, wind speed).
17. Simulate rigid body dynamics (shattering wall, breaking glass).
18. Utilize cinematography in animation.
19. Describe the process of motion capture for animation.

Advanced Game Development and Publishing 113602

This course will focus on creating games using code, 3D characters, objects, and animation utilizing game engines. Students will see how the skills and knowledge acquired in Game Design I-III come together. Students will create work ready products for the industry. Students will participate in Game Jams to practice working with teams and deadlines.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Compare and contrast licensed vs. proprietary game engines.
2. Debate the strengths and weaknesses of various game engines.
3. Discuss the impact of a game engine on the development of a game.
4. Explain how game engines work.
5. Explain character advancement in relation to storyline and gameplay.
6. Define the size of player environment.
7. Explain locations and purpose of non-player character (NPC).
8. Specify boundaries and borders of the levels within the game.
9. Justify placement of triggers and scripted events.
10. Develop a game with multiple levels.
11. Research types of GUI.
12. Recognize and implement required feedback for the GUI.
13. Create a flowchart that maps the GUI's functionality.
14. Design and implement a GUI using wireframes.
15. Create a victory condition.
16. Assemble immersive elements into a game.
17. Establish a reward systems and in-game economies.
18. Apply game mechanics to game world.
19. Balance and test game mechanics.
20. Integrate different types of audio including sound effects, ambient background, dialog, and score.
21. Practice creating sound loops.
22. Determine acceptable media files for game development such as sound, graphics, and video.
23. Import appropriate media for a game.
24. Incorporate feedback sounds.
25. Compare and contrast the benefits of various platforms and their target markets.
26. Evaluate need for flexibility and scalability when developing for a PC.
27. Explore development tools specific to various consoles.
28. Research procedures to deliver a game to mobile markets.
29. Pitch a project and defend why it is entertaining.
30. Explain the role of social media in marketing.
31. Describe crowd sourcing and crowd funding.
32. Explain the merchandizing and branding behind video games.

33. Analyze successful trailers.
34. Explain the concepts of localization and its impact on design.
35. Describe various pay models, such as free-to-play, pay-to-play, singer-user license, and freemium.
36. Describe integration of social components in a game.
37. Explain the role of social media in the gaming community.
38. Describe professional events in digital gaming.
39. Summarize characteristics of cloud gaming.
40. Evaluate the advances of multi-player gaming.
41. Discuss trends in input devices.
42. Examine current trends in output devices and displays.
43. Explore advances in peripheral devices.

AP Computer Science A 110701

The Advanced Placement Program enables willing and academically prepared students to pursue college level studies – with the opportunity to earn college credit, advanced placement, or both – while still in high school. AP exams are given each year in May. Students who earn a qualifying score on an AP Exam are typically eligible to receive college credit and/or placement into advanced courses in college. Every aspect of AP course and exam development is the result of collaboration between AP teachers and college faculty. They work together to develop AP courses and exams, set scoring standards, and score the exams. College faculties review every AP teacher's course syllabus.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design, implement, and analyze solutions to problems.
2. Use and implement commonly used algorithms.
3. Develop and select appropriate algorithms and data structures to solve new problems.
4. Write solutions fluently in an object-oriented paradigm.
5. Write, run, test, and debug solutions in the Java programming language, utilizing standard Java library classes and interfaces from the AP Java Subset.
6. Read and understand programs consisting of several classes and interacting objects.
7. Read and understand a description of the design and development process leading to such a problem.
8. Understand the ethical and social implications of computer use.

AP Computer Science Principles 110711

AP Computer Science Principles is designed to introduce students to the central ideas of computer science, to instill ideas and practices of computational thinking, and to have students engage in activities that show how computing changes the world. The course is rigorous and rich in computational content, includes computational and critical thinking skills, and engages students in the creative aspects of the field. Through both its content and pedagogy, this course aims to appeal to a broad audience.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use computing tools and techniques to create artifacts.
2. Collaborate in the creation of computational artifacts.
3. Analyze computational artifacts; use computing tools and techniques for creative expression.
4. Use programming as a creative tool.
5. Describe the combination of abstractions used to represent data.
6. Explain how binary sequences are used to represent digital data.
7. Develop and abstraction.
8. Use multiple levels of abstraction in computation.
9. Use models and simulations to raise and answer questions.
10. Use computers to process information to gain insight and knowledge.
11. Collaborate when processing information to gain insight and knowledge.
12. Communicate insight and knowledge gained from using computer programs to process information.
13. Use computing to facilitate exploration and the discovery of connections in information.
14. Use large data sets to explore and discover information and knowledge.
15. Analyze the considerations involved in the computational manipulation of information.
16. Develop an algorithm designed to be implemented to run on a computer.
17. Express an algorithm in a language.
18. Appropriately connect problems and potential algorithmic solutions.
19. Evaluate algorithms analytically and empirically.
20. Explain how programs implement algorithms.
21. Use abstraction to manage complexity in programs.
22. Evaluate a program for correctness.
23. Develop a correct program.
24. Collaborate to solve a problem using programming.
25. Employ appropriate mathematical and logical concepts in programming.
26. Explain the abstractions in the Internet and how the Internet functions.
27. Explain characteristics of the Internet and systems built on it.
28. Analyze how characteristics of the Internet and system built on it influence their use.
29. Connect the concern of cybersecurity with the Internet and the systems built on it.
30. Analyze how computing affects communication, interaction, and cognition.

31. Collaborate as part of a process that scales.
32. Connect computing with innovations in other fields.
33. Analyze the beneficial and harmful effects of computing.
34. Connect computing within economic, social, and cultural context.

App Development with Swift 110821

App Development with Swift allows students to build a foundation in Swift, UIKit, and networking through hands-on labs and guided projects. At the end of each of the first five units, students will complete guided projects. Through these projects, students will create features that interest them, all while performing the type of work they can expect in an app development workplace. In the last unit, students will examine how to design, prototype, and architect an app of their own design.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Explain the basics of data, operators, and control flow in Swift.
2. Explain the basics of documentation, debugging, Xcode, building and running an app, and Interface Builder.
3. Apply this knowledge to create a simple flashlight app.
4. Explore Swift strings, functions, structures, collections, and loops.
5. Explore UIKit and how to display data using Auto Layout and stack views.
6. Practice this knowledge to build a word-guessing game app.
7. Discover how to build simple workflows and navigation hierarchies using navigation controllers, tab bar controllers, and segues.
8. Examine two powerful tools in Swift, optionals and enumerations.
9. Apply this knowledge into practice with a personalized survey that reveals a response to the user.
10. Discover scroll views, table views, and building complex input screens.
11. Explore how to save data, share data to other apps, and work with images in the user's photo library.
12. Practice these skills with a task-tracking app that allows the user to add, edit, and delete items in a familiar tablebased interface.
13. Customize the task-tracking app to keep track of any type of information.
14. Determine how to use animations, concurrency, and how to work with the web.
15. Apply this knowledge with a customizable menu app that displays the available dishes from a restaurant and allows the user to submit an order.
16. Use a web service that allows students to set up a menu with customized menu items and photos.
17. Design, prototype, and architect a project of their own design.
18. Build this project independently.

C# I 110214

This course introduces students to fundamental programming concepts using the C# programming language. Instruction includes data types, control structures, simple data structures, error-handling, object-oriented programming, graphical user interfaces, and modular programming.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of the program development life cycle.
2. Design, develop, compile, debug, test, run, and document programs in the C# language.
3. Design and develop programs using operators and assignments.
4. Design and develop programs using primitive data types.
5. Design and develop programs that use sequence, selection, and repetition structures.
6. Design and develop programs that use array data structures.
7. Design and develop programs that use effective error and exception handling.
8. Design and develop programs that implement user-defined methods and modular programming.
9. Design and develop programs that implement file processing.
10. Design and develop event-driven programs that work with a graphical user interface (GUI).
11. Design and develop programs using object oriented programming features.
12. Evaluate and critique effectiveness and efficiency of code.

C# II 110215

This course provides students with an extensive overview of designing and developing advanced object-oriented applications using the C# programming language. Includes advanced graphical user interfaces, event-driven programming, advanced data types and structures, concurrency, file and data based processing, mobile computing, and other advanced topics.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design and develop event-driven programs that use advanced GUI components.
2. Design and develop programs that use object oriented programming concepts.
3. Design and develop programs that use advanced data types and structures.
4. Design and develop programs that use concurrency.
5. Design and develop programs that implement file and database processing.
6. Design and develop programs that introduce mobile application concepts.
7. Design and develop programs that incorporate other advanced features of C# programming.
8. Evaluate and critique effectiveness and efficiency of code.

C++ I 110202

Introduce students to fundamental programming concepts using the C++ programming language. Topics include data types, control structures, simple data structures, error-handling, modular programming, and information and file processing.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of the program development life cycle.
2. Design, develop, compile, debug, test, run, and document programs in the C++ language using a software development kit.
3. Design and develop programs using operators and assignments.
4. Design and develop programs using primitive data types.
5. Design and develop programs using sequence, selection, and repetition structures.
6. Design and develop programs using single and multi-dimensional arrays.
7. Design and develop programs using pointers.
8. Design and develop programs using void and value passing function.
9. Design and develop programs using objects orientated programming features, including defining classes and instantiating objects.
10. Design and develop programs using effective error and exception handling.
11. Evaluate and critique effectiveness and efficiency of code.

C++ II 110216

This course introduces students to advanced programming concepts using C++. Instruction includes advanced data structures, concurrency, innovative algorithms, advanced file processing, and topics that are unique to C++.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of advanced C++ concepts and associated definitions.
2. Design, develop, compile, debug, test, run, and documents advanced programs in C++.
3. Design and develop programs that use advanced data structures.
4. Design and develop programs that use concurrency.
5. Design and develop programs that use innovative algorithms and techniques, including recursion.
6. Design and develop programs using polymorphism, inheritance, and overloading.
7. Design and develop programs that use advanced file processing.
8. Examine and evaluate the strengths and weaknesses of C++.
9. Design and develop programs that incorporate other advanced features of C++.
10. Evaluate and critique effectiveness and efficiency of code written.

Computational Thinking 110251

Computational Thinking promotes understanding of computer programming and logic by teaching students to think like a computer. It covers skills needed to develop and design language-independent solutions to solve computer-related problems. Instruction covers development and design basics including use of variables, control and data structures, and principles of command-line and object-oriented languages.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate an understanding of elementary logic, truth tables, and Boolean algebra.
2. Demonstrate programming style best practices.
3. Illustrate the flow of a program.
4. Illustrate concepts using one or more programming languages.
5. Explain the implications of file processing.
6. Describe the steps addressed in the design of a program to solve the state problem.
7. Describe the principles of object-oriented programming.
8. Develop algorithms with increasing degree of complexity using structured programming techniques such as: sequence, selection, and repetition.
9. Use fundamental data types and data structures such as: integers, reals, characters, strings, Booleans, one - and two - dimensional arrays.
10. Analyze the binary representation of data.
11. Use modular programming.

Computer Hardware and Software Maintenance 110101

This course presents a practical view of computer hardware and client operating systems. It also covers computer hardware components; troubleshooting, repair, and maintenance; operating system interfaces and management tools; networking components; computer security; and operating procedures.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 – 1

Students will:

1. Identify and explain motherboard components.
2. Identify, install, configure, and upgrade personal computer components.
3. Perform device driver installation, scheduled maintenance, and memory and firmware updates.
4. Identify common tools, basic diagnostic procedures, troubleshooting techniques, and preventative maintenance methods.
5. Explain and apply the troubleshooting process to diagnose and repair common hardware and software problems.
6. Demonstrate and understanding of conversion between binary, decimal, hexadecimal number systems.
7. Compare and contrast client operating systems and their features.
8. Use multiple user interfaces, including command-line, to perform operating system management tasks, to configure, optimize and upgrade the current client operating system and to diagnose network connection issues.
9. Use and manage file systems, operating system utilities, backup programs, and optimization tools.
10. Describe the process to install, configure, secure and troubleshoot a basic small or home office network.
11. Identify the fundamental principles of networking and security.
12. Describe and apply appropriate operational procedures including safety, environmental procedures, good communication skills, and professional behavior.

Computer Literacy 110110

This course provides an introduction to the computer and the convergence of technology as used in today's global environment. Introduces topics including computer hardware and software, file management, the Internet, e-mail, the social web, green computing, security and computer ethics. Instruction presents basic use of application, programming, systems, and utility software. Basic keyboarding skills are strongly recommended.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Describe basic computer functions and use correct computer terminology.
2. Use a course management system.
3. Utilize computer technology as a tool to access, manage, prepare, and present information.
4. Identify trends in information processing and new emerging technologies.
5. Explain the impact of computers upon society including effects of social technologies, green computing, dangers of excessive use, and disposal of obsolete equipment.
6. Identify and analyze ethical issues such as copyright, privacy, and security as related to computing.
7. Explain the difference between application, programming, system, and utility software.
8. Use a graphical user interface-based operating system to manage files, folders and disks.
9. Use application software packages to prepare basic documents, spreadsheets, databases, and presentations.
10. Describe and explain basic data communications and network technologies and functions.
11. Identify and use basic e-mail and Internet functions and understand their capabilities.
12. Describe globalization and challenges including technological barriers, electronic payments, and varying cultures.
13. Describe cloud computing and its more impact on business and personal systems.

Computer Science (NICERC) 110225

Computer Science is a project-driven, application-based course spread over 11 topic areas and divided into four overarching instructional units. Computer Science engages students in an immersive exploration of the breadth of the field of computer science. Students design and create programs, construct simple circuits, and discuss impacts of computer science in society. Students also hone their problem solving skills through several puzzles that accompany each topic area.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Develop algorithms as solutions to problems while discovering the importance of understanding problems in order to develop efficient step-by-step solutions.
2. Explore the reasons for using computers to execute problem solutions.
3. Translate algorithms to a language computers can understand.
4. Explore various major data manipulation and processing structures used by computers.
5. Explore and utilize structures as to design algorithms to solve problems.
6. Apply computer architecture including using a Raspberry Pi platform to learn how computer hardware provides a powerful platform on which to run software.

Computers, Networks, and Databases 111001

This project-based-learning course engages students who are curious about informatics. In this course, students will learn how to use a design process to create systems that acquire, store and communicate data for a variety of career fields. Students will work collaboratively in teams to design systems, solve problems, think critically, be creative, and communicate with each other and business partners. Students will participate in real-world experiences such as designing an inventory system for a retail store, comparing stores in a company to project future sales, track customer buying habits, and more. Lastly, students will engage in leadership skill sets encompassing their student organization responsibilities.

Districts that offer this SREB Advanced Career Course must have a SREB signed agreement and instructors must have taken the two-week per course training prior to teaching the course. Please see the link to SREB for further information. This course is Course 1 – Informatics in the SREB Advanced Career Curriculum.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use the technical design process to design, build, and test prototypes.
2. Use terminology of the field.
3. Use data and informatics tools to make decisions and solve problems.
4. Apply project management principles.
5. Use appropriate and effective research skills.
6. Demonstrate proficiency in word processing, spreadsheets, databases, and presentation software.
7. Communicate information, including descriptive statistics, to various stakeholder groups.

Cyber Literacy I (NICERC) 110222

Cyber Literacy I is a hands-on course that builds a strong cyber foundation for high schools students. The course introduces students to cyber by blending robotics, programming, electricity, and elements of liberal arts. Students learn about the opportunities, threats, responsibilities, and legal constraints associated with operative in cyberspace. Throughout the course, students learn the basics of electricity, programming, and networking as well as develop critical thinking skills. Cyber Literacy I lays a foundation for further exploration into STEM and cyber-related topics.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Apply the fundamentals of electricity including the basic movement of electrons and experiments that include chemistry, circuitry, and magnetism.
2. Apply BASIC Programming including basic coding essentials through flowcharts, the use of simple programming languages, and the use of simple programming tasks.
3. Engage with the Parrallax® Boe-Bot® microcontroller as a platform for learning robotics fundamentals.
4. Assemble robots to perform various functions through the implementation of sensors.
5. Apply programming knowledge including the use of autonomous devices, the use of programming components such as conditional and unconditional loops, subroutines, and variable manipulation.
6. Relate electrical components like LEDs, piezo-crystal elements, infrared light, and tactile sensors to cyber.
7. Illustrate real world applications and implications of computers and the internet in our society today.
8. Deliberate the historical and societal context of cyber.
9. Engage in a lab and project-driven lesson regarding learning about cyberspace.
10. Engage in a lab and project-driven lesson regarding the ethical concerns about online behavior, cyber bullying, and cybersecurity.
11. Engage in a lab and project-driven lesson regarding the ethical concerns about designing autonomous devices and artificial intelligence.

Cyber Literacy II (NICERC) 110223

Cyber Literacy II is a project-driven course that expands a student's understanding of cyberspace through two primary topics: systems engineering and liberal arts. The Cyber Literacy II course builds upon fundamental cyber skills developed in Cyber Literacy I and challenges students to go deeper into the world of cyberspace. Students will utilize a microcontroller to construct complex systems that bring together a variety of components and will identify real-world connections as they discuss the liberal arts/humanities crossovers that exist with today's technologies. Many aspects of science, engineering, technology, and mathematics are discussed through each of the projects. Students are challenged to create flowcharts with each build as well as read schematics instead of relying on wiring diagrams.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Apply systems engineering to build a variety of multi-component projects.
2. Employ flowcharts to discuss data flow and pseudo-code.
3. Engage in a variety of labs and project-driven lessons that prompt learning regarding robotics.
4. Combine components onto a platform to design autonomous systems while considering the real-world impact of the systems and how they impact the students' environment.
5. Synthesize content with issues including privacy, security, and technology.
6. Synthesize content with issues including search warrants, digital media, and the requirements to obtain a search warrant.
7. Synthesize content with issues including cyberbullying and real-world examples of the implications of cyberbullying.
8. Defend a position in debates on national security.
9. Engage in a variety of labs and project-driven lessons that prompt learning regarding the impact and relationship between expectations of privacy and security.

Cyber Science (NICERC) 110224

Cyber Science is an innovative, project-driven course that integrates science, technology, engineering, and mathematics (STEM) disciplines with liberal arts. Cyber Science uses the Parrallax® Boe-Bot® robot as a platform for teaching important cyber concepts and fundamentals. Throughout the course, students are engaged in a systems-level approach to problem-solving using robotics and computer science in the context of liberal arts. Seamlessly integrating the different disciplines provides students with a dynamic learning environment and a unique educational experience. Through Cyber Science, students are not only able to make meaningful connections between STEM and liberal arts, they also learn how to become better cyber citizens. The lessons in the course are divided into five main units: Programming Basics, Foundations of Computer Science, Networking and Security, Artificial Intelligence, and Ethics and Societal Issues. A major strength of this course is that unit components are purposefully interwoven together and provide the students with a holistic view of cyber.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Apply programming basics including developing programming skills through a progression of Boe-Bot® activities.
2. Apply foundations of computer science including Boolean logic, variables, flow charts, data structures, and sorting using Boe-Bot® applications.
3. Apply networking and security foundations including showcasing the structure of networks as well as the vulnerabilities.
4. Demonstrate the need for security through emphasizing man-in-the-middle attacks, cryptography, and stenography.
5. Utilize artificial intelligence including applying the concepts of heuristics.
6. Utilize sensors to read input in order to produce a desired output through various Boe-Bot® projects.
7. Explore the historical, ethical, and societal impacts of cyber.
8. Defend a position in debates regarding cyber.

Cybersecurity (PLTW) 110230

Cybersecurity introduces the tools and concepts of cybersecurity and encourages students to create solutions that allow people to share computing resources while protecting privacy. Nationally, computational resources are vulnerable and frequently attacked; in Cybersecurity, students solve problems by understanding and closing these vulnerabilities. This course raises students' knowledge of and commitment to ethical computing behavior. It also aims to develop students' skills as consumers, friends, citizens, and employees who can effectively contribute to communities with a dependable cyber-infrastructure that moves and processes information safely.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Access to curriculum for the PLTW Computer Science Program requires a District/School Agreement with PLTW. Updated course content and information can be obtained from the PLTW Computer Science website.

Databases in the Cloud 111003

This project-based-learning course is for students who successfully completed courses one and two and who want to tackle the more complex challenges that business and industry face. Students at this level will learn about Web technologies, cloud storage, information security, data, animations, introductory computer programming and database applications. Students will take more responsibility for their own learning, problem solving and thinking outside of the box. Real-world challenges will require higher levels of research, building, testing, analyzing and improving systems. Students will develop solutions for real-world problems by designing a database for ticket sales; designing security for a database; creating a game with animation; reporting information based on population data in a community; and designing, building and testing an application for a database.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use terminology of the field.
2. Research informatics technical texts, journal articles, and other related documents in developing a plan.
3. Use the five-step software/system life cycle (design, build, test, implement, and evolve).
4. Use informatics concepts to solve problems.
5. Use data and informatics tools to make decisions and solve problems.
6. Apply project management principles.
7. Gain information on how the American computer industry works.
8. Use appropriate and effective research skills.
9. Use best practices to design and implement research studies.
10. Use the scientific method to design investigations.
11. Demonstrate proficiency in word processing, spreadsheets/databases, and presentation software.
12. Communicate information, including descriptive statistics, to various audiences.

Design for the Digital World 111002

This project-based-learning course engages students who are interested in applying the design process to create systems such as a cloud-based digital storage system for images. Students will design a system to automatically collect and report data on highway usage. They will apply a geospatial system to map a store and develop a database that studies shopping habits. Through these projects, students will learn about data management and logic-based queries by collecting data, using the Global Positioning Systems (GPS) and analyzing data utilizing a geographic information system (GIS). They will learn how to automate data collection to make processes more effective and efficient. Students will work collaboratively in teams and demonstrate their knowledge and skills by presenting new and innovative ideas, techniques and solutions to business and industry partners.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use terminology of the field.
2. Research informatics technical texts, journal articles, and other related documents in developing a plan.
3. Use the five-step software/system life cycle (design, build, test, implement, and evolve).
4. Use informatics concepts to solve problems.
5. Use data and informatics tools to make decisions and solve problems.
6. Apply project management principles.
7. Gain information on how the American computer industry works.
8. Use appropriate and effective research skills.
9. Use best practices to design and implement research studies.
10. Use the scientific method to design investigations.
11. Demonstrate proficiency in word processing, spreadsheets/databases, and presentation software.
12. Communicate information, including descriptive statistics, to various audiences.

Design for the Internet 110213

This course introduces basic computer graphics with special emphasis on graphics for games.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Identify the principles of communication through visual medium using text, still imagery and video technology.
2. Explain copyright laws affecting digital graphics including images and image use.
3. Identify the purpose of, audience, storyboarding, and audience needs for preparing images.
4. Explain the design process for various forms of digital media.
5. Identify considerations of designing for a specific audience, including paid customers.
6. Analyze and evaluate digital media content for audience, purpose and design techniques.
7. Identify trends in the use and creation of digitally generated media.
8. Explain the key elements of drawing and painting.
9. Explain image resolution, image size, and image file format for the web, video, and print.
10. Demonstrate effective message composition and design using industry standard design elements and principles.
11. Explain the principles of image composition.
12. Explain digital typography.
13. Differentiate between typeface and font.
14. Demonstrate digital camera and scanner operation.
15. Define digital image terminology.
16. Explain image and editing layers.
17. Demonstrate importing, exporting, organizing, and saving digital graphic files.
18. Manipulate image selections and measurement.
19. Use digital graphic editing software guides and rulers.
20. Transform digital images using editing applications.
21. Adjust or correct the tonal range, color, or distortions of an image using editing applications.
22. Explain retouching and blending images.
23. Explain and apply digital image editing filters.
24. Prepare images for web, print, and video.
25. Identify career and entrepreneurial opportunities in digital graphics technology.

Developing a Cloud Presence 111004

Students in this capstone course will focus on the ethics of privacy, social networking, designing for clients and artificial intelligence through six authentic projects. Students will select a business partner and design, build and test a Web presence for a company that will apply the concepts from the three prior courses. Student teams will work collaboratively with a business partner to develop a proposal for the project with evaluation criteria. Once the business partner accepts the proposal, the student team will implement it by designing, planning, building the system, and testing and revising the system to meet the needs of the business. Depending on articulation agreements or state policy, opportunity for dual credit may be available to students who successfully complete this course.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Use terminology of the field.
2. Research informatics technical texts, journal articles, and other related documents in developing a plan.
3. Use the five-step software/system life cycle (design, build, test, implement, and evolve).
4. Use informatics concepts to solve problems.
5. Use data and informatics tools to make decisions and solve problems.
6. Apply project management principles.
7. Gain information on how the American computer industry works.
8. Use appropriate and effective research skills.
9. Use best practices to design and implement research studies.
10. Use the scientific method to design investigations.
11. Demonstrate proficiency in word processing, spreadsheets, databases, and presentation software.
12. Communicate information, including descriptive statistics, to various audiences.

Digital 3D Graphics and Special Effects II 113604

This course will focus on creating games using code, 3D characters, objects, and animation utilizing game engines. Students will see how the skills and knowledge acquired in the first three courses of the Digital Design and Game Development pathway come together. Students will create work ready products for the industry. Introduces advanced texturing and lighting techniques to enhance depth perception and realism within 3D environments.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Demonstrate an understanding of how to add textures to objects.
2. Use appropriate types of lighting techniques to designs.
3. Demonstrate adding depth using different types of shadowing techniques.
4. Create custom connections and color utilities to innovative designs.
5. Use indirect and direct illumination to designs.

Digital Literacy 060112

Students will use a computer and application software including word processing, presentation, database, spreadsheet, internet, and email to prepare elementary documents and reports. The impact of computers on society and ethical issues are presented. Leadership development will be provided through FBLA (Future Business Leaders of America) and/or DECA.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Use a word processing program to create, save, print, modify, spell-check, and grammar-check a simple document.
2. Use a word processing program to enhance the appearance of a simple document by using centered, right justification, boldface, underlined, and italicized text.
3. Use a word processing program to change the default margins and line spacing.
4. Use a word processing program to create a document with headers, footers, and footnotes.
5. Use a presentation program with text body, graphics, and animation.
6. Use an electronic spreadsheet program to create, save, print, modify, and obtain graphs from a simple spreadsheet.
7. Use an electronic spreadsheet program to perform basic mathematical operations including, but not limited to, addition, subtraction, multiplication and division.
8. Use an electronic spreadsheet program to calculate averages and percentages.
9. Use an electronic spreadsheet program to enhance the appearance of a spreadsheet by changing fonts, foreground, and background colors and centering text across columns.
10. Use a database management program to create, maintain, and print reports from a simple relational database.
11. Use a database management program to customize the user interface by creating and maintaining forms and reports.
12. Use a database management program to query tables using basic query operations such as “and”, “or”, “not”.
13. Print in landscape and portrait orientations.
14. Use the component of the operating system that helps the user manipulate files and folders to copy, move, rename, and delete files and to create, copy, move, rename, and delete folders.
15. Use the World Wide Web browser to navigate hypertext documents and to download files.
16. Use Internet search engines and understand their advantages and disadvantages.
17. Use an electronic mail program to send and receive electronic mail.
18. Identify components of a computer.
19. Discriminate between ethical and unethical uses of computers and information.
20. Demonstrate a basic understanding of issues regarding software copyright, software licensing, and software copying.

21. Demonstrate an awareness of computer viruses and basic understanding of ways to protect a computer from viruses.
22. Demonstrate a basic understanding of the impact of computers on society.
23. Use and understand basic computer terminology.

Flash with Action Script 110810

This course will help students gain knowledge about Flash and apply the fundamental principles for creating video, web sites, and interactive gaming projects.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Work with Flash Tools and Menus.
2. Demonstrate an understanding of Graphics using Flash.
3. Understand and work on Editing Objects.
4. Demonstrate usage of Working with Layers.
5. Work on Editing and Formatting Text.
6. Use the Creating Symbols: Graphic, Movie Clip, and Button in Flash.
7. Use the Creating Buttons in Flash.
8. Demonstrate and understanding of using Animations – Designing and Editing.
9. Understand ActionScript in Flash.
10. Use Audio – Acquiring and Editing in Flash.
11. Demonstrate an understanding for Putting Components Together in Flash.
12. Demonstrate how to Publish Flash Files.
13. Demonstrate Game Design using Flash ActionScript.

Game Design and Development Principles 113605

This course is an introduction to Game Design and Gaming. The course provides and overview of story development, gaming history, game reviews, current gaming trends and industry software. Students will begin to create and develop a game story/plot that can be further developed in higher level courses as well as critique current games. In addition, 2D game development software and image manipulation will be explored to further enhance their design skills. Career exploration into game design will be researched and gain awareness of job and post-secondary opportunities.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Explain the history of computing technologies that impact the game development industry.
2. Explore non-digital games.
3. Research the evolution of video games.
4. Describe the different game genres.
5. Evaluate contributions of individual game designers and developers.
6. Explore careers as a game artist and sound designer.
7. Describe the role of game designer.
8. Explore careers as a game developer.
9. Describe career pathways in quality assurance/testing.
10. Explain the role of the producer.
11. Explain the career path of an independent developer.
12. Research salary structures in the industry.
13. Define common terminology and their acronyms.
14. Identify the tools to develop a game (engine, application program interface [API], digital content creation tools, editors).
15. Communicate both in writing and verbally using appropriate industry terminology.
16. Compare and contrast the entertainment software rating boards (ESRB) ratings for game.
17. Explain the principles of visual design.
18. Explain the elements of design.
19. Analyze artwork/designs for specific design theories.
20. Explore the components of game structure.
21. Analyze the essentials of storytelling.
22. Write and outline of a nonlinear story.
23. Create rules for a game.
24. Compare conflict and outcomes.
25. Develop objectives and outcomes for a game.
26. Explain the importance of usability and how it impacts user experience.
27. Explain in-game economies, motivators, and reward systems.
28. Research various styles of game documentation.
29. Develop a technical design document (TDD).

30. Describe components of a game design document (GDD).
31. Produce a game design document.
32. Produce a game pitch document.
33. Present game documentation.
34. Compare and contrast categories of game mechanics.
35. Research victory condition mechanics of a game.
36. Discuss relationship between game mechanics and game complexity and interactions.
37. Incorporate game mechanics into a game.
38. Explain basic logic statements such as if/then and cause/effect.
39. Describe uses of Boolean operators and symbols associated with them.
40. Generate truth tables for game events.
41. Examine different number systems including binary, decimal, and hexadecimal.
42. Demonstrate proper use of order of operations.
43. Convert mathematical formulas into code.
44. Explain when to apply mathematical concepts common to game coding.
45. Use logical thinking to create a diagram of code execution.
46. Research laws that govern intellectual property in diverse forms.
47. Evaluate Creative Commons and open source licensure.
48. Cite the boundaries of third-party work.
49. Explain copyright, trademarks, and other intellectual property protection.
50. Explain invasion of privacy in the use of technology.
51. Model acceptable security practices.
52. Explore the issues of piracy and digital rights management (DRM).
53. Analyze your personal digital footprint.
54. Discuss social responsibility and issues concerning gaming.
55. Model legal and ethical use of information.
56. Identify key elements of non-disclosure agreements (NDA) and contracts.

Help Desk Operations 110102

Help Desk Operations introduces a variety of tools and techniques to provide user support in help desk operations. The course explores help desk concepts, customer service skills, troubleshooting problems, writing for end users, help desk operations and software, needs analysis, facilities management, and other topics related to end user support.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Define the role of help desk and customer service in an organization.
2. Evaluate help desk technology, tools, and techniques.
3. Identify common support problems, including software tools and features.
4. Identify service technology trends.
5. Demonstrate professional and effective communication skills.
6. Demonstrate team building strategies.
7. Develop technical training materials, and other user documentation to support help desk operations.
8. Demonstrate a methodical approach to the problem-solving process.
9. Apply conflict resolution techniques and skills in customer support.
10. Exhibit positive professionalism with customers and technical writing skills.
11. Demonstrate personal, system, and stress management by way of using self-help tools.
12. Use support performance and reporting tools, call management software, problem resolution software, asset and change management tools, and notification tools for support in additional level two and level three support tools.

Information Technology Co-Op 110918

Cooperative Education for CTE courses provide supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved capstone course during the same school year that the co-op experience is completed. Students who participate receive a salary for these experiences, in accordance with local, state and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experiences.
5. Receive exposure the facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Information Technology Internship 110919

Internship for CTE courses provide supervised work-site experience for high school students who are enrolled in a capstone course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester of longer and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less). All information references to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Internet Technologies 110917

This course provides students with a study of traditional and emerging Internet technologies. Also covered are other topics including Internet fundamentals, Internet applications, Internet delivery systems, and Internet client/server computing. Internet Technologies provides a hands-on experience and some rudimentary programming in an Internet environment.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Describe the history of the Internet and its impact on government, society, and business.
2. Describe the models used to organize Internet technologies.
3. Explain how the Internet is governed and the standards that are used.
4. Describe the protocols that make the Internet work.
5. Use Internet technologies for data transfer, remote access, information delivery, email, content presentation, and real-time collaboration.
6. Describe how the Internet is used for e-commerce.
7. Describe Internet naming conventions, URL's, and web server file organization.
8. Describe core connectivity issues such as NAT, ISP's, and IP addresses.
9. Create and publish simple web content using basic HTML.
10. Use existing scripting applications and create simple client/server applications to enhance information delivery.

Introduction to Computer Science 110710

Introduction to Computer Science is designed to introduce students to the breadth of the field of computer science through an exploration of engaging and accessible topics. Rather than focusing the entire course on learning particular software tools or programming languages, the course is designed to focus on the conceptual ideas of computing and help students understand why certain tools or languages might be utilized to solve particular problems. The goal of the course is to develop in students the computational practices of algorithm development, problem solving and programming within the context of problems that are relevant to the lives of today's students. Students will also be introduced to topics such as interface design, limits of computers, and societal and ethical issues.

Introduction to Computer Science may be taken in place of computer literacy in the pathway if proficiency has been demonstrated.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Analyze the characteristics of hardware components to determine the applications for which they can be used.
2. Use appropriate tools and methods to execute Internet searches which yield requested data.
3. Evaluate the results of web searches and the reliability of information found on the Internet.
4. Explain the differences between tasks that can and cannot be accomplished with a computer.
5. Analyze the effects of computing on society within economic, social, and cultural contexts.
6. Communicate legal and ethical concerns raised by computing innovation.
7. Explain the implications of communication as data exchange.
8. Name and explain the steps they use in solving a problem.
9. Solve a problem by applying appropriate problem-solving techniques.
10. Express a solution using standard design tools.
11. Determine if a given algorithm successfully solves a stated problem.
12. Create algorithms that meet specified objectives.
13. Explain the connections between binary numbers and computers.
14. Summarize the behavior of an algorithm.
15. Compare the tradeoffs between different algorithms for solving the same problem.
16. Explain the characteristics of problems that cannot be solved by an algorithm.
17. Use appropriate algorithms to solve problems.
18. Design, code, test, and execute a program that corresponds to a set of specifications.
19. Select appropriate programming structures.
20. Locate and correct errors in a program.
21. Explain how a particular program functions.

22. Justify the correctness of a program.
23. Create programs with practical, personal, and/or societal intent.
24. Describe the features of appropriate data sets for specific problems.
25. Apply a variety of analysis techniques to large data sets.
26. Use computers to find patterns in data and test hypotheses about data.
27. Compare different analysis techniques and discuss the tradeoffs among them.
28. Justify conclusions drawn from data analysis.
29. Describe ways in which computing enables innovation.
30. Discuss the ways in which innovations enabled by computing affects communications and problem solving.
31. Analyze how computing influences and is influenced by the cultures for which they are designed and the cultures in which they are used.
32. Analyze how social and economic values influence the design and development of computing innovations.
33. Discuss issues of equity, access, and power in the context of computing resources.
34. Communicate legal and ethical concerns raised by computational innovations.
35. Discuss privacy and security concerns related to computational innovations.
36. Explain positive and negative effects of technological innovations on human culture.

Introduction to Database Design 110211

This course provides an overview of database and database management system concepts, internal design models, normalization, network data models, development tools, and applications.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Define a database and its uses.
2. Describe the difference between traditional files and databases.
3. Define a database management system (DBMS) and describe the services a DBMS provides to it users.
4. Identify and describe the main features of hierarchical, network, and relational database models.
5. Demonstrate an understanding of the difference between logical and physical design.
6. Model a realistic business application using a technology-independent data model.
7. Design and implement a database using the relational model, with emphasis on data integrity and security.
8. Define and use the normalization process to further refine the relational table definitions.
9. Demonstrate an understanding of the database administration function.
10. Define and be able to use data definition language, data manipulation language, and instructions that apply relational algebra.
11. Demonstrate an understanding of distributed database systems.
12. Evaluate and select an appropriate DBMS for a given application.

Introduction to Digital Game Graphics 113601

This course will focus on creating games using code, animation, and an introduction to 3D design software utilized in the industry. In addition, students will see how the skills and knowledge acquired in Game Design I and II come together utilizing a game engine.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Identify the target audience of a game.
2. Explain impact of "feature creep" on production.
3. Explain the interdependence of team members between artistic, technical and production disciplines.
4. Explain the purpose of prototyping.
5. Outline in detail the process of developing a game from concept to delivery and support.
6. Describe each step of the production process.
7. Explain how the project is going to be managed according to a milestone plan.
8. Explain the various types of collaboration tools.
9. Utilize the production pipeline in the development of a game.
10. Explain the value of version control.
11. Explain the purpose of vertical slice.
12. Demonstrate version control for example, Node Version Manager (NVM).
13. Demonstrate good quality assurance practices.
14. Conceptualize and illustrate original game characters and assets.
15. Utilize illustration to create assets.
16. Establish a standard for world scale.
17. Create a storyboard for planning animation.
18. Change an object's state or position over time.
19. Establish an object's relative speed.
20. Simulate a naturally occurring or mechanical cycle such as walking.
21. Apply animation to game assets.
22. Describe the role of typography.
23. Evaluate the use of layout and composition.
24. Explain color theory.
25. Describe the principles of animation.
26. Describe the role of perspective.
27. Demonstrate 1 and 2 point perspective.
28. Draw a proportionally correct figure.
29. Describe the characteristics and purposes of 2D, 2.5D, and 3D art.
30. Recognize the importance of and implement continuity of art style.
31. Describe environments within a game.
32. Compare process of creating an interior vs. exterior environment.
33. Identify components in an environment.
34. Generate terrains for a specific environment.

35. Create hard surface assets.
36. Create an environment.
37. Develop organics for a specific environment.
38. Describe archetypes of characters.
39. Explain character personalities and stereotypes.
40. Compart and contrast methods to design characters.
41. Describe the character's evolution throughout the game.
42. Examine importance of non-player characters (NPC).
43. Construct character(s) for a game.
44. Differentiate between syntax and semantics.
45. Incorporate primitive data types.
46. Utilize arrays to store a list of primitive data types.
47. Demonstrate input from different sources.
48. Construct and register a callback function.
49. Compare and contrast constants and variables.
50. Select and implement conditional control.
51. Implement functions.
52. Select and implement iterations (loops, recursion,).
53. Recognize and implement sequential control.
54. Test and debug programs.
55. Design and implement user-defined data types.
56. Demonstrate output to different destinations.
57. Practice object-oriented programming (OPP).
58. Identify expected input and output.
59. Utilize basic steps in algorithmic problem solving.
60. Discuss top-down versus bottom-up development.
61. Generate test cases and expected results.
62. Apply simple data structures.
63. Explain how algorithms are used to produce artificial intelligences (AI).

Introduction to Networking Concepts (non-vendor) 110901

This course introduces technical level concepts of non-vendor specific networking including technologies, media, topologies, devices, management tools, and security. Provides the basics of how to manage, maintain, troubleshoot, install, operate, and configure basic network infrastructure.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Differentiate between network protocols in terms of routing, addressing schemes, interoperability, and naming conventions.
2. Identify addressing format, schemes, and technologies; and required settings for connectivity including classful/classless address ranges, public/private addressing, and subnetting.
3. Identify the common ports associated with TCP (Transmission Control Protocol) and UDP (User Datagram Protocol).
4. Identify the basic standards of WAN and remote access technologies.
5. Categorize standard cable types and their properties.
6. Explain logical and physical network structures, topologies, and characteristics.
7. Identify the basic attributes, purposes, and functions of network components including wireless technologies.
8. Identify the functions of specialized network devices such as multilayer switches, load balancer, proxy, DNS servers, and CSU/DSU.
9. Plan and implement a basic wired and wireless network.
10. Explain the function of each layer of the OSI and TCP/IP models.
11. Identify types of configuration management documentation such as network diagrams, wiring schematics, and configurations.
12. Summarize and explain different methods and rationales for network performance.
13. Diagnose a network problem using a systemic approach identifying the appropriate tools, selecting an appropriate course of action to resolve the problem, and document the solution.
14. Select the appropriate hardware and software tools to test, scan, and analyze network connectivity and performance.
15. Identify and explain common methods to ensure network security including antivirus software, user authentication, and firewall setup.
16. Identify issues that affect physical and remote access device security.

Introduction to Programming 110201

This course focuses on the general writing and implementation of generic and atomized programs to drive operating systems. Instruction includes software design, languages, and program writing, and trouble-shooting. Students are introduced to fundamental programming concepts using an industry-specific or emerging programming language. Includes data types, control structures, simple data structures, error-handling, modular programming, information and file processing, and uniqueness of the language used in the course.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of the program development life cycle.
2. Design, develop, compile, debug, test, run, and document programs in the language studied.
3. Design and develop programs using operators and assignments.
4. Design and develop programs that properly use variable, constants, data types, and objects.
5. Design and develop programs that use sequence, selection, and repetition structures.
6. Design and develop programs that use simple data structures.
7. Design and develop programs that use effective error and exception handling.
8. Design and develop programs that implement user-defined methods and modular programming.
9. Design and develop programs that implement file processing.
10. Design and develop programs that implement fundamental features that are unique to the language studied.
11. Design and develop programs using object oriented programming features, if applicable to the language studied.
12. Evaluate and critique effectiveness and efficiency of code written.

JAVA Programming I 110205

Java Programming I introduces students to fundamental programming concepts using the Java programming language. Topics include data types, control structures, simple data structures, error-handling, object-oriented programming, graphical user interfaces, and modular programming.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design, develop, compile, debug, test, run, and document programs in the Java language using a software development kit.
2. Design and develop programs using operators and assignments.
3. Design and develop programs using primitive data types.
4. Design and develop programs using sequence, selection, and repetition structures.
5. Design and develop programs using single and multi-dimensional arrays.
6. Design and develop programs using effective error and exception handling.
7. Design and develop programs using object oriented programming features, including defining classes, instantiating objects, and using arrays of objects.
8. Design and develop programs implementing user-defined methods and modular programming.
9. Design and develop programs using method overloading.
10. Design and develop programs using inheritance, encapsulation, and polymorphism.
11. Design and develop GUI interfaces for Java applications.
12. Evaluate and critique effectiveness and efficiency of code.

JAVA Programming II 110206

Java Programming II provides students with an extensive overview of designing and developing advanced object-oriented applications using the Java programming language. Topics include input and output streams (file processing), polymorphism, inheritance, multithreading, recursion, mobile computing, and other advanced topics.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design and develop programs that use advanced GUI components.
2. Design and develop programs that use input and output streams including character and binary streams.
3. Design and develop programs that use multithreading.
4. Design and develop programs that use polymorphism.
5. Design and develop programs that use inheritance.
6. Design and develop programs that use recursion.
7. Design and develop programs that introduce mobile application concepts.
8. Design and develop programs that incorporate other advanced features of Java programming.
9. Evaluate and critique effectiveness and efficiency of code.

JavaScript 110809

This course provides students with an overview of the JavaScript scripting language. Includes coding, testing, and debugging JavaScript programs; using variable, operators, and data types; creating dynamic web pages using JavaScript; controlling the behavior of forms, buttons, and text elements; and using control structures, pattern matching, objects, and application scripts.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design, develop, compile, debug, test, run, and document programs in the JavaScript language.
2. Design and develop programs using operators and assignments.
3. Design and develop programs using a variety of data types.
4. Demonstrate the input and output processes in JavaScript.
5. Design and develop programs using sequence, selection, and repetition structures.
6. Demonstrate pattern matching using JavaScript.
7. Demonstrate JavaScript objects.
8. Demonstrate the ability to write JavaScript application scripts.
9. Evaluate and critique effectiveness and efficiency of code.

LAN Switching and Wireless/Scaling Networks/Cisco III 110904

This course covers the architecture, components, and operations of routers and switches in a larger and more complex network. Helps students learn how to configure routers and switches for advanced functionality. Helps students to configure and troubleshoot routers and switches and resolve common issues with OSPF, EIGRP, STP, and VTP in both IPv4 and IPv6 networks. Helps students to develop the knowledge and skills needed to implement DHCP and DNS operations in a network.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Configure and troubleshoot DHCP and DNS operations for IPv4 and IPv6.
2. Describe the operations and benefits of the Spanning Tree Protocol (STP).
3. Configure and troubleshoot STP operations.
4. Describe the operations and benefits of link aggregation and Cisco VLAN Trunk Protocol (VTP).
5. Configure and troubleshoot VTP, STP, and RSTP.
6. Configure and troubleshoot basic operations of routers in a complex routed network for IPv4 and IPv6.
7. Configure Open Shortest Path First (OSPF) protocol (single-area OSPF and multi-area OSPF).
8. Configure Enhanced Interior Gateway Routing Protocol (EIGRP).
9. Configure and troubleshoot advanced operation of routers and implement RIP, OSPF, and EIGRP routing protocols for IPv4 and IPv6.
10. Configure and manage Cisco IOS Software licensing and configuration files.

Leadership Dynamics – Information Technology 110399

This course is designed to assist students with developing skills needed to be successful leaders and responsible members of society. This student will develop personal attributes and social skills. Emphasis will be placed on interpersonal skills, team building, communication, personal development and leadership. This course will include opportunities for students to apply their knowledge.

Recommended Grade Level: 9 – 12

Recommended Credit: .5 – 1

Students will:

1. Investigate types of leadership and determine personal style.
2. Compare and contrast positive and negative characteristics of leaders.
3. Identify the role of leadership in the global society.
4. Assess the role that qualified leaders have on the success of organizations.
5. Explain how cultural and social diversity and equity impact leadership skills.
6. Identify and explain the importance of team membership skills for individuals and groups.
7. Develop interpersonal skill for resolving conflicts that occur in the home, school, community and workplace.
8. Demonstrate verbal and nonverbal communication skills needed for personal and leadership roles.
9. Make informed decisions using decision-making process.
10. Demonstrate appropriate parliamentary procedure skills used in meetings.
11. Analyze leadership opportunities available in school and community.
12. Describe how ethical and social behaviors affect individuals.
13. Develop personal goals.
14. Demonstrate appropriate business, progression and social etiquette.
15. Analyze the role self-management has on use of time and stress.

Management of Support Services 110302

Digitally organizing the information technology and information and support services milestones achieved by the student that is reflective of their industry certification readiness, understanding the cost of doing business and preparation of technical and behavioral job performances such as interviews. The course also focuses on employability skills to include: a professional digital portfolio that emphasizes critical milestones focusing on entry level information technology technical and employability skills. This course could be taken with the help desk course enhancing skills in both courses.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Determine purpose and goals using a project management method.
2. Define, Design, Develop, Deploy, Reflect, Redesign, and Present utilizing presentation software visualizing the process.
3. Determine roles, tasks, calendars.
4. Utilize Software packages for project management (MS Project, Excel, Visio, Dread-Spark, Prezi).
5. Utilize and define appropriate terminology.
6. Present information in a technical report.
7. Publish information presenting to an advisory board member.
8. Identify potential employment barriers for non-traditional groups and ways to overcome the barrier.
9. Research potential barriers placing information in a spreadsheet.
10. Present information to school principals and peers.
11. Synthesize the information collecting producing a product that could help overcome the barrier with non-traditional groups.

Microsoft Active Directory Server 110907

This course provides students with the knowledge and skills to configure and administer a network server infrastructure including DNS, WINS, DHCP and RRAS Servers. Covers hot to implement and configure secure network access and implement fault tolerant storage technologies, network technologies most commonly used with Windows Servers and IP-enabled networks, and secure servers and maintain update compliance.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Install and configure servers.
2. Describe and demonstrate administration of DNS.
3. Configure and manage WINS.
4. Configure and troubleshoot DHCP.
5. Demonstrate knowledge of IPv4 TCP/IP.
6. Demonstrate practical application of IP Addressing and Subnetting.
7. Demonstrate knowledge of IPv6 TCP/IP.
8. Configure and troubleshoot Routing and Remote Access.
9. Install, configure, and troubleshoot the Network Policy Server Role service.
10. Configure Network Access Protection.
11. Describe and configure IPsec.
12. Monitor and troubleshoot IPsec.
13. Describe and demonstrate management of a Distributed File System.
14. Configure and manage storage technologies.
15. Configure availability of network resources and content.
16. Configure server security compliance.

Microsoft Client/Server Configuration 110913

This course covers installation and configuration of Microsoft Windows client and server operating systems.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Evaluate hardware compatibility for installation.
2. Install and upgrade the Windows client operating system and migrate user data.
3. Manage file systems, partitions, disks and devices.
4. Install, configure, and control access to applications including desktop application and Windows Store apps.
5. Configure Client Hyper-V.
6. Configure Transmission Control Protocol/Internet Protocol (TCP/IP) settings and network security settings.
7. Configure Remote Management and remote connections.
8. Configure local and shared access for files and folders.
9. Configure, secure, and manage mobile computing.
10. Monitor and optimize operating system performance and resource usage.
11. Implement disaster protection, including backup and file recover options.
12. Create and manage user accounts and groups.
13. Configure printing and print services.
14. Configure and troubleshoot the boot process and System Recovery options.

Network Fundamentals/Cisco I 110902

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. Students are introduced to the principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations. Helps students to be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Describe the devices and services used to support communications in data networks and the Internet.
2. Describe the role of protocol layers in data networks.
3. Describe the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments.
4. Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks.
5. Explain fundamental Ethernet concepts such as media, services, and operations.
6. Design a simple Ethernet network using routers, switches, cables, connectors and other hardware.
7. Demonstrate the Cisco command-line interface (CLI) commands to perform basic router and switch configurations.
8. Utilize common network utilities to verify small network operations and analyze data traffic.

Network Hardware Installation and Troubleshooting 110906

This course is designed to provide students with the knowledge and skills necessary to design, install, configure, and troubleshoot cabling systems and equipment used to connect a local area network.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design a basic network layout using copper and/or fiber optic cabling systems.
2. Terminate, test, and troubleshoot copper wire systems.
3. Install and configure network interface cards and connection equipment.
4. Use industrial standard testing and certification equipment.

Perl I 110217

Perl I provides students with an overview of the Perl scripting language. Instruction includes coding, testing, and debugging Perl programs; using variables, operators, and data types; and using control structures, pattern matching, objects, and application scripts.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design, develop, compile, debug, test, run, and document programs in the Perl language.
2. Design and develop programs using operators and assignments.
3. Design and develop programs using a variety of data types.
4. Demonstrate the input and output processes in Perl.
5. Design and develop programs using sequence, selection, and repetition structures.
6. Demonstrate patter matching using Perl.
7. Demonstrate Perl objects.
8. Evaluate and critique effectiveness and efficiency of code.

PHP I 110218

This course explores the fundamentals of PHP, with emphasis on syntax, structure, and current usages. Instruction includes dynamic generation of web pages, fluid forms, and web security.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate basic knowledge of programming in PHP.
2. Demonstrate knowledge of variables, strings, data types, and operations.
3. Utilize sequence, selection, and repetition structures.
4. Create functions and use built-in functions.
5. Utilize arrays.
6. Create forms and utilize scripts.
7. Manipulate files on a server.
8. Demonstrate an understanding of the object-oriented features of PHP.
9. Evaluate and critique effectiveness and efficiency of code.

PHP II 110219

Explores the dynamic features of PHP and how it can interact to form spontaneous websites and dynamic features rich content.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of a secure PHP environment.
2. Apply global Windows extensions.
3. Demonstrate multiple field queries.
4. Identify form elements.
5. Demonstrate knowledge of relational databases and normalization.
6. Identify SQL databases used with PHP scripts.
7. Create a complete Content Management System (CMS).
8. Utilize XML as a data storage scheme.
9. Evaluate and critique effectiveness and efficiency of code.

Productivity Software 110204

This course utilizes current word processing, spreadsheet, databases, and presentation application software to solve common technology and business problems. It covers basic features of each software application.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Use a productivity software package to create, edit, print, and save documents.
2. Use productivity tool such as spelling and grammar.
3. Apply formatting features such as font, color, margins, headers, footers.
4. Use tools such as cut, copy, and paste within a document and between documents.
5. Create HTML file formats for web publishing.
6. Create new documents using templates and wizards.
7. Use a word processing program to insert and use table features.
8. Use a word processing program to insert and use table column features.
9. Insert pictures and Clipart into word processing documents.
10. Use a spreadsheet package to create common business reports and budgets.
11. Use mathematical formulas and common statistical, date, financial, and logical functions.
12. Make formatting changes to a worksheet including column width, row height, cell, and table formatting.
13. Use autofill to copy and paste formulas and repeat patterns.
14. Create effective charts, including bar, line, and pie charts, to accompany business reports.
15. Use a relational database management program to create tables, queries, forms, reports, and labels.
16. Use query features to extract information from a database using simple and compound conditions.
17. Use relationship feature to join tables in a database and obtain information from multiple tables.
18. Plan and create an electronic slide show presentation using a presentation software package.
19. Use timing, transition, and animation features to enhance a presentation.

Project-Based Programming 110226

This project-based learning course engages those students with an entrepreneurial spirit that are interested in programming and in finding solutions to existing problems through the creation of applications. In this capstone course, students will create projects that require computer science fundamentals and extensive research to successful complete. Students will work either solo or in a team to execute a project decided upon by the student(s). Students must learn and demonstrate proficiency in time management, scope, research, computer science, and teamwork to be successful in this course. Finally, students will engage in leadership skills by being held accountable for completion of their tasks or project. The teacher will act more as facilitator in this course and is highly encouraged to create his/her own project to demonstrate teacher "buy in" to students.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Manage and modify scope to ensure success.
2. Apply time management skills to effectively complete project to specifications.
3. Use programming language of choice to develop a project of choice.
4. Demonstrate continuous improvement through feedback from one-on-one meetings each week and regular project updates with the facilitator.
5. Use appropriate and effective research skills.
6. Demonstrate proficiency in computer science fundamental and design patterns.
7. Architect a project for the semester.
8. Demonstrate use of version control through Git.
9. Demonstrate manipulation of search terms in Google to obtain valid and useful results.

Python I 110220

Python I introduces students to fundamental programming concepts using the Python programming language. Instruction includes data types, control structures, simple data structures, error-handling, modular programming, object oriented programming, graphical user interfaces, and file processing.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Design, develop, compile, debug, test, run, and document programs in the Python language.
2. Design and develop programs using operators and assignments.
3. Design and develop programs using a variety of data types.
4. Demonstrate the input and output processes in Python.
5. Design and develop programs using sequence, selection, and repetition structures.
6. Design and develop programs using arrays, lists and tuples.
7. Design and develop programs using simple GUI components.
8. Demonstrate Python objects.
9. Evaluate and critique effectiveness and efficiency of code.

Python II 110221

Python II provides students with an extensive overview of designing advanced computer applications using the Python programming language. Instruction includes graphical user interfaces, event-driven programming, modular programming, advanced object-oriented programming, advanced data types and structures, input validation, error-handling, database processing, and client/server programming.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of advanced concepts and associated definitions.
2. Design and implement programs that use well developed GUI components.
3. Design, develop, compile, debug, test, run, and document advanced programs in the language.
4. Design and develop programs that use advanced data structures.
5. Design and develop programs that use Python for clients and server programming.
6. Design and develop programs that use innovative algorithms and techniques, including recursion.
7. Design and develop programs using polymorphism, inheritance, and overloading.
8. Design and develop programs that use advanced file processing.
9. Examine and evaluate the strengths and weaknesses of the language.
10. Design and develop programs that incorporate other advanced features of the language.
11. Evaluate and critique effectiveness and efficiency of code written.

Routing Protocols and Concepts/Cisco II 110903

Covers the architecture, components, and operations of routers and switches in a small network. Helps students learn how to configure a router and a switch for basic functionality. Helps students configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPv2, single-area and multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Describe basic switching concepts and the operation of Cisco switches.
2. Describe enhanced switching technologies such as VLANs, VLAN Trunking Protocol (VTP), Rapid Spanning Tree Protocol (RSTP), Per VLAN Spanning Tree Protocol (PVSTP), and 802.1q.
3. Troubleshoot basic operations of a small switched network.
4. Describe the purpose, nature, and operations of a router, routing tables, and the route lookup process.
5. Configure and troubleshoot static routing and default routing.
6. Describe how VLANs create logically separate networks and how routing occurs between them.
7. Describe dynamic routing protocols, distance vector routing protocols, and link-state routing protocols.
8. Configure and troubleshoot basic operations of routers in a small routed network using Routing Information Protocol (RIPv1 and RIPv2).
9. Configure and troubleshoot basic operations of routers in a small routed network using Configure Open Shortest Path First (OSPF) protocol (single-area OSPF).
10. Configure and troubleshoot VLANs and inter-VLAN routing.
11. Describe the purpose and types of access control lists (ACLs).
12. Prepare, monitor, and troubleshoot access control lists (ACLs) for IPv4 and IPv6.
13. Describe the operations and benefits of Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) for IPv4 and IPv6.
14. Describe the operations and benefits of Network Address Translation (NAT).
15. Configure and troubleshoot Network Address Translation (NAT) operations.

Security Fundamentals 110912

Security Fundamentals introduces basic computer and network security concepts and methodologies. Covers principles of security; compliance and operational security; threats and vulnerabilities; network security; application, data, and host security; access control and identity management; and cryptography.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Explain basic security concepts.
2. Identify and explain appropriate use of security tools to facilitate security.
3. Evaluate current security issues related to computer and network systems.
4. Evaluate and select appropriate incident response procedures, disaster recovery, and risk identification techniques to ensure business continuity.
5. Differentiate various malware and systems security threats against computers and networks.
6. Explain the vulnerabilities and mitigations associated with computers and network devices.
7. Explain the proper use of common tools for carrying out vulnerability assessments.
8. Identify and describe potential application and data vulnerabilities, including buffer overflow, DLL injection, and SQL injection.
9. Explain how host firewalls, malware protection, and updates are important to application and data security.
10. Describe the importance of user accounts and associated permissions.
11. Compare and discuss logical and physical access control security methods.
12. Explain authentication models and identify components of each model.
13. Summarize and explain general cryptography concepts.
14. Demonstrate public and private key pairs for digital signing and encryption/decryption.

Special Topics, Computer Science 110752

Special Topics courses may be utilized, with justification for the course and course objectives, upon approval by the Information Technology Consultant related to career major.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Complete tasks defined by the teacher and approved by the Information Technology Consultant in the Office of Career and Technical Education.

Special Topics, Information Support and Services 110152

Special Topics courses may be utilized, with justification for the course and course objectives, upon approval by the Information Technology Consultant related to career major.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Complete tasks defined by the teacher and approved by the Information Technology Consultant in the Office of Career and Technical Education.

Special Topics, Networking 110952

Special Topics courses may be utilized, with justification for the course and course objectives, upon approval by the Information Technology Consultant related to career major.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Complete tasks defined by the teacher and approved by the Information Technology Consultant in the Office of Career and Technical Education.

Special Topics, Programming 110252

Special Topics courses may be utilized, with justification for the course and course objectives, upon approval by the Information Technology Consultant related to career major.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Complete tasks defined by the teacher and approved by the Information Technology Consultant in the Office of Career and Technical Education.

Special Topics, Web Development/Administration 110852

Special Topics courses may be utilized, with justification for the course and course objectives, upon approval by the Information Technology Consultant related to career major.

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Complete tasks defined by the teacher and approved by the Information Technology Consultant in the Office of Career and Technical Education.

Visual Basic I 110207

Visual Basic I introduces students to fundamental programming concepts using the Visual Basic programming language. Topics include data types, control structures, simple data structures, error-handling, modular programming, event-driven programming, graphical user interfaces, and file processing.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Demonstrate knowledge of the program development life cycle.
2. Design, develop, compile, debug, test, run, and document event-drive programs in the Visual Basic programming language.
3. Design and develop programs using operations and assignments.
4. Design and develop programs using primitive data types.
5. Design and develop programs using sequence, selection, and repetition structures.
6. Design and develop programs using single and multi-dimensional arrays.
7. Demonstrate knowledge of file processing in Visual Basic.
8. Demonstrate knowledge of object oriented programming features in Visual Basic.
9. Design and develop programs using effective error and exception handling.
10. Evaluate and critique effectiveness and efficiency code.

Visual Basic II: Creating Desktop Applications 110208

Visual Basic II provides students with an extensive overview of designing advanced computer applications using the Visual Basic programming language. Instruction includes graphical user interfaces, event-driven programming, modular programming, object-oriented programming, advanced data types and structures, input validation, error handling, and file and database processing.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Design and develop an event-driven application, including a well-designed user interface.
2. Demonstrate understanding of modular design.
3. Demonstrate understanding of object-oriented programming.
4. Design and code applications using advanced data types and structures.
5. Implement input validation and processing.
6. Demonstrate error-checking and error handling.
7. Implement file and database processing.
8. Evaluate and critique effectiveness and efficiency of code.

Web Page Development 110801

This course introduces web pages through the use of HTML and CSS. Students use text and/or web editors to create web documents with various formats and page layouts, multimedia, tables and forms. Instruction emphasizes W3C web design and accessibility standards.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Plan the layout of a website.
2. Use HTML (Hypertext Markup Language).
3. Use CSS (Cascading Style Sheets).
4. Create lists and tables in organization content.
5. Use HTML and CSS in page layout.
6. Create web forms.
7. Use multimedia in the creation of a website (such as images, sound, and video).
8. Publish web pages to a web site.

Web Site Design and Production 110804

This course introduces web site production processes with particular emphasis on design involving layout, navigation, interactivity, and using web production software.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Utilize principles of graphic and content creation for online media.
2. Use fundamental online graphic design principles including appropriate interactivity, content sensitive navigation schemes and user interface criteria.
3. Select task-appropriate software tools.
4. Utilize web site accessibility.
5. Utilize web site implementation and hosting.
6. Edit and enhance digital video images using state-of-the-art software.

JROTC

JROTC CAREER PATHWAYS

Air Force JROTC CIP 28.0101.00

This pathway introduces students to the theory and practice of air science, life in the U.S. Air Force, and prepares them for cadet status (Junior ROTC or JROTC) or for service as commissioned reserve or active duty officers (Senior AFROTC or ROTC). Programs are offered as adjuncts to regular high school instructional programs.

BEST PRACTICE COURSES

Complete (3) three credits:

- 580134 Air Force JROTC 1
- 580135 Air Force JROTC 2
- 580136 Air Force JROTC 3

Choose (1) one credit from the following:

- 580137 Air Force JROTC 4 **OR** 580138 Air Force JROTC Leadership

Army JROTC CIP 28.0301.00

This pathway introduces students to the theory and practice of military science, life in the U.S. Army and prepares them for cadet status (Junior ROTC or JROTC) or for service as commissioned reserve or active duty officers (Senior AROTC or ROTC). Programs are offered as adjuncts to regular high school instructional programs.

BEST PRACTICE COURSES

Complete (3) three credits:

- 580240 Army Junior ROTC Level 1
- 580241 Army Junior ROTC Level 2
- 580242 Army Junior ROTC Level 3

Choose (1) one credit from the following:

- 580243 Army Junior ROTC Level 4 **OR** 580244 Army Junior ROTC Leadership

Marine Corps JROTC CIP 28.0401.02

This pathway introduces students to the theory and practice of naval science, life in the U.S. Marine Corps and prepares them for cadet status (Junior ROTC or JROTC) or for service as commissioned reserve or active duty officers (Senior NROTC or ROTC). Programs are offered as adjuncts to regular high school or college instructional programs.

BEST PRACTICE COURSES

Complete (3) three credits:

- 580320 Marine Corps JROTC 1
- 580321 Marine Corps JROTC 2
- 580322 Marine Corps JROTC 3

Choose (1) one credit from the following:

- 580323 Marine Corps JROTC4 **OR** 580324 Marine Corps JROTC Leadership

Navy JROTC CIP 28.0401.01

This pathway introduces students to the theory and practice of naval science, life in the U.S. Navy and prepares them for cadet status (Junior ROTC or JROTC) or for service as commissioned reserve or active duty officers (Senior NROTC or ROTC). Programs are offered as adjuncts to regular high school instructional programs.

BEST PRACTICE COURSES

Complete (3) three credits:

- 580310 Navy JROTC 1
- 580311 Navy JROTC 2
- 580312 Navy JROTC 3

Choose (1) one credit from the following:

- 580313 Navy JROTC 4 **OR** 580314 Navy JROTC Leadership

JROTC Courses

Air Force JROTC 1 580134

This is the first course in a four-course sequence designed to develop Aerospace Science (AS), Leadership (LE) and Wellness Skills in preparation for a career in the U.S. Air Force. Each course in the sequence includes a selection from the AS 100 to 500, LE 100 to 500 and Wellness education as identified in the AFJROTC Curriculum.

Recommended Grade Level: 9

Recommended Credit: 1

Students will:

1. Identify history, organization, mission, goals, and objectives of JROTC for all services.
2. Identify basic orientation of aerospace industry; flight aeronautics, aircraft maintenance, aeronautical engineering and space.
3. Study the historical development of flight and the role of the military aviation in history.
4. Study military heritage, organization, tradition, self-control, drill, and proper wear of the Air Force uniform.
5. Demonstrate understanding of military aerospace policies during 1st year.
6. Identify how army Air Force JROTC can impact your future.
7. Explain the mission of the Air Force JROTC.
8. Develop a high degree of strong morals, self-esteem, self-reliance, personal appearance, and leadership.
9. Demonstrate employability and social skills relative to the career cluster (includes cell phone, internet etiquette, introductions, and grammar).
10. Adhere to the values of integrity, service and excellence.
11. Compare and contrast positive and negative characteristics of being a leader.
12. Increase understanding of patriotism and responsibilities of U.S. citizens.
13. Demonstrate the ability to maintain a healthy lifestyle.
14. Participate in community service activities.
15. Study the history of and how the U.S. Air Force has been involved in making our Nation's history.
16. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
17. Demonstrate citizenship lessons by performing public service projects throughout the area.
18. Expand skills of critical thinking and problem solving, communication and collaboration, and creativity and innovation.
19. Demonstrate military customs, courtesies, and traditions to develop habits of order, social skills, and discipline.
20. Acquire a broad-based knowledge of aerospace studies and leadership education.
21. Strive to graduate from high school and prepare for college and careers in the 21st century.
22. Cultivate a commitment to physical fitness and a healthy lifestyle.

23. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
24. Learn how to read topographic maps and air navigation.
25. Participate in Leadership challenge and Academic Bowl (JLAB).
26. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
27. Participate in JROTC Raider Challenge, a competitive program in five different Fitness and Skills events.
28. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
29. Perform in drill formations, regulations, and exhibition/pageantry categories for drill competitions.

Air Force JROTC 2 580135

This is the second course in a four-course sequence designed to develop Aerospace Science (AS), Leadership (LE) and Wellness Skills in preparation for a career in the U.S. Air Force. Each course in the sequence includes a selection from the AS 100 to 500, LE 100 to 500 and Wellness education as identified in the AFJROTC Curriculum.

Prerequisite: Air Force JROTC 1 580134

Recommended Grade Level: 10

Recommended Credit: 1

Students will:

1. Identify Foundations of Air Force Foundations.
2. Identify basic orientation of aerospace industry: flight aeronautics, aircraft maintenance, aeronautical engineering and space.
3. Study the historical development of flight and the role of the military aviation in history.
4. Study military heritage, organization, tradition, self-control, drill, and proper wear of the Air Force uniform.
5. Demonstrate understanding of military aerospace policies.
6. Identify how army Air Force JROTC can impact your future.
7. Explain the mission of the Air Force JROTC.
8. Develop a high degree of strong morals, self-esteem, self-reliance, personal appearance, and leadership.
9. Demonstrate employability and social skills relative to the career cluster (includes cell phone, internet etiquette, introductions, and grammar).
10. Demonstrate an understanding of the environment in which aircraft and spacecraft operate.
11. Compare and contrast positive and negative characteristics of being a leader.
12. Increase understanding of patriotism and responsibilities as U.S. citizens.
13. Demonstrate the ability to maintain a healthy lifestyle.
14. Learn flight and navigation principles and complete survival training in the woods.
15. Study the history of and how the U.S. Air Force has been involved in making our Nation's history.
16. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
17. Demonstrate citizenship lesions by performing public service projects throughout the area.
18. Expand skills of critical thinking and problem solving, communication and collaboration, and creativity and innovation.
19. Demonstrate military customs, courtesies, and traditions to develop habits of order, social skills, and discipline.
20. Acquire a broad-based knowledge of aerospace studies and leadership education.
21. Strive to graduate from high school and prepare for college and careers in the 21st century.
22. Cultivate a commitment to physical fitness and a healthy lifestyle.

23. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
24. Learn how to read topographic maps and air navigation.
25. Display proper manner to wear uniform, awards, decorations, and insignia.
26. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
27. Participate in fitness assessment that must be completed within three hours.
28. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
29. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Air Force JROTC 3 580136

This is the third course in a four-course sequence designed to develop Aerospace Science (AS), Leadership (LE) and Wellness Skills in preparation for a career in the U.S. Air Force. Each course in the sequence includes a selection from the AS 100 to 500, LE 100 to 500 and Wellness education as identified in the AFJROTC Curriculum.

Prerequisites: Air Force JROTC 1 580134 **AND** Air Force JROTC 2 580135

Recommended Grade Level: 11

Recommended Credit: 1

Students will:

1. Identify history, organization, mission, goals, and objectives of JROTC for all services.
2. Identify basic orientation of aerospace industry; flight aeronautics, aircraft maintenance, aeronautical engineering and space.
3. Study the historical development of flight and the role of the military aviation in history.
4. Study military heritage, organization, tradition, self-control, drill, and proper wear of the Air Force uniform.
5. Discuss military aerospace policies.
6. Identify how army Air Force JROTC can impact your future.
7. Explain the mission of the Air Force JROTC.
8. Develop a high degree of strong morals, self-esteem, self-reliance, personal appearance, and leadership.
9. Demonstrate employability and social skills relative to the career cluster (includes cell phone, internet etiquette, introductions, and grammar).
10. Adhere to the values of integrity, service and excellence.
11. Compare and contract positive and negative characteristics of being a leader.
12. Increase understanding of patriotism and responsibilities as U.S. citizens.
13. Demonstrate the ability to maintain a healthy lifestyle.
14. Learn flight and navigation principles and complete survival training in the woods.
15. Study the history of and how the U.S. Air Force has been involved in making our Nation's history.
16. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
17. Demonstrate citizenship lesions by performing public service projects throughout the area.
18. Expand skills of critical thinking and problem solving, communication and collaboration, and creativity and innovation.
19. Demonstrate military customs, courtesies, and traditions to develop habits of order, social skills, and discipline.
20. Acquire a broad-based knowledge of aerospace studies and leadership education.
21. Strive to graduate from high school and prepare for college and careers in the 21st century.
22. Cultivate a commitment to physical fitness and a healthy lifestyle.

23. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
24. Learn about flight navigation and the purpose of navigation aids.
25. Participate in JROTC Academic Bowl, a competition that improves academic strength and interest in college.
26. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
27. Participate in Cyber Patriot, a competition to inspire students towards STEM careers.
28. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
29. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Air Force JROTC 4 580137

This is the fourth course in a four-course sequence designed to develop Aerospace Science (AS), Leadership (LE) and Wellness Skills in preparation for a career in the U.S. Air Force. Each course in the sequence includes a selection from the AS 100 to 500, LE 100 to 500 and Wellness education as identified in the AFJROTC Curriculum.

Prerequisites: Air Force JROTC 1 580134, Air Force JROTC 2 580135, **AND** Air Force JROTC 3 580136

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Identify history, organization, mission, goals, and objectives of JROTC for all services.
2. Identify basic orientation of aerospace industry; flight aeronautics, aircraft maintenance, aeronautical engineering and space.
3. Study the historical development of flight and the role of the military aviation in history.
4. Study military heritage, organization, tradition, self-control, drill, and proper wear of the Air Force uniform.
5. Discuss military aerospace policies.
6. Identify how army Air Force JROTC can impact your future.
7. Explain the mission of the Air Force JROTC.
8. Develop a high degree of strong morals, self-esteem, self-reliance, personal appearance, and leadership.
9. Demonstrate final study of communication skills, drill, proper wear and respect for the Air Force uniform.
10. Develop an understanding of the environment in which aircraft and spacecraft operate.
11. Compare and contrast positive and negative characteristics of being a leader.
12. Increase understanding of patriotism and responsibilities as U.S. citizens.
13. Demonstrate leadership as role model, coach and counselor, plus assist instructor while managing the Corps of Cadets in a Participate in community services activities.
14. Participate in community services activities.
15. Study the history and how the U.S. Air Force has been involved in making our Nation's history.
16. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
17. Demonstrate citizenship lessons by performing public service projects throughout the area.
18. Expand skills of critical thinking and problem solving, communication and collaboration, and creativity and innovation.
19. Demonstrate military customs, courtesies, and traditions to develop habits of order, social skills, and discipline.
20. Acquire a broad-based knowledge of aerospace studies and leadership education.
21. Strive to graduate from high school and prepare for college and careers in the 21st century.

22. Cultivate a commitment to physical fitness and a healthy lifestyle.
23. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
24. Learn about flight navigation and the purpose of navigation aids.
25. Participate in JROTC Academic Bowl, a competition that improves academic strength and interest in college.
26. Promote STEM (Science, Technology, Engineering, and Mathematics) Camp.
27. Participate in Cyber Patriot, a competition to inspire students towards STEM careers.
28. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
29. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Air Force JROTC Leadership 580138

This class is intended to challenge students who have completed or are in the process of completing their fourth year AFJROTC curriculum and desire advanced study of key aerospace subjects. The Honors course will challenge students to perform as peer leaders and to further their knowledge of air and space operations, missions of auxiliary organizations, and to be well versed on the evolving mission of the Air Force.

Prerequisites: Air Force JROTC 1 580134, Air Force JROTC 2 580135, Air Force JROTC 3 580136, **AND** Air Force JROTC 4 580137

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Apply theories and techniques learned in previous leadership courses.
2. Apply leadership and management competencies through corps management activities.
3. Demonstrate strengthened organizational skills through corps activities.
4. Study military heritage, organization, tradition, tradition, self-control, drill, and proper wear of the Air Force uniform.
5. Discuss military aerospace policies.
6. Identify how army Air Force JROTC can impact your future.
7. Study the exploration of Space and Astronomy.
8. Develop a high degree of strong morals, self-esteem, self-reliance, personal appearance, and leadership.
9. Demonstrate employability and social skills relative to the career cluster including cell phones, internet etiquette, introductions, and grammar.
10. Adhere to the values of integrity, service and excellence.
11. Compare and contrast positive and negative characteristics of being a leader.
12. Increase understanding of patriotism and responsibilities as U.S. citizens.
13. Demonstrate leadership as role model, coach and counselor, plus assist instructor while managing the Corps of Cadets in a leadership position.
14. Participate in community service activities.
15. Study the history and how the U.S. Air Force has been involved in making our Nation's history.
16. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
17. Demonstrate citizenship lessons by performing public service projects throughout the area.
18. Expand skills of critical thinking and problem solving, communication and collaboration, and creativity and innovation.
19. Demonstrate military customs, courtesies, and traditions to develop habits of order, social skills, and discipline.
20. Acquire a broad-based knowledge of aerospace studies and leadership education.
21. Strive to graduate from high school and prepare for college and careers in the 21st century.

22. Cultivate a commitment to physical fitness and a healthy lifestyle.
23. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
24. Learn about flight navigation and the purpose of navigation aids.
25. Display proper manner to wear uniform, awards, decorations, and insignia.
26. Promote STEM (Science, Technology, Engineering, and Mathematics) Camp.
27. Participate in Cyber Patriot, a competition to inspire students towards STEM careers.
28. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
29. Perform in drill formations, regulations, and exhibition categories for drill competitions.
30. Provide examples of character, organizational responsibility, and leadership for younger cadets.

Army JROTC 1 580240

This is the first course in a four-course sequence that provides instruction on wear of the military uniform, military customs and courtesies, the National Anthem, the American flag, and the purpose of JROTC.

Recommended Grade Level: 9

Recommended Credit: 1

Students will:

1. Identify Foundations of Army Foundations.
2. Demonstrate employability and social skills relative to the career cluster including cell phone, internet etiquette, introductions, and grammar.
3. Comprehend concepts to become a leader by using leadership skills.
4. Demonstrate the ability to use study skills.
5. Perform wellness, fitness, and first aid.
6. Achieve a healthy lifestyle.
7. Study the history and how the U.S. military has been involved in making our Nation's history.
8. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
9. Demonstrate citizenship lessons by performing public service projects throughout the area.
10. Demonstrate advanced skills using a database program to create enhanced reports.
11. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.
12. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
13. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
14. Learn how to read topographic maps and learn how to use a compass to navigate cross-country.
15. Participate in Leadership challenge and Academic Bowl (JLAB).
16. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
17. Participate in JROTC Raider Challenge, a competitive program in five different Fitness and Skills events.
18. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
19. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Army JROTC 2 580241

This is the second course in a four-course sequence that focuses on the principles of leadership and marching also known as Drill and Ceremonies.

Prerequisite: Army JROTC 1 580240

Recommended Grade Level: 10

Recommended Credit: 1

Students will:

1. Identify Foundations of Army Foundations.
2. Identify how Army JROTC can impact your future.
3. Explain the mission of the Army JROTC.
4. Demonstrate the ability to use decision-making skills to enhance health.
5. Demonstrate protocol to show respect for and handling of the United States flag.
6. Demonstrate employability and social skills relative to the career cluster (includes cell phone, internet etiquette, introductions, and grammar).
7. Comprehend concepts to know how to lead by using leadership skills.
8. Compare and contrast positive and negative characteristics of being a leader.
9. Demonstrate the ability to use study skills.
10. Perform wellness, fitness, and first aid.
11. Achieve a healthy lifestyle by understanding that you are what you eat and the proper nourishment of the body.
12. Study the history and how the U.S. military has been involved in making our Nation's history.
13. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
14. Demonstrate citizenship lessons by performing public service projects throughout the area.
15. Demonstrate advanced skills using a database program to create enhanced reports.
16. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.
17. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
18. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
19. Learn how to read topographic maps and land navigation.
20. Participate in Leadership challenge and Academic Bowl (JLAB).
21. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
22. Participate in JROTC Raider Challenge, a competitive program in five different Fitness and Skills events.
23. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.

24. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Army JROTC 3 580242

This is the third course in a four-course sequence that develops study skills, communication skills, and conflict resolution.

Prerequisites: Army JROTC 1 580240 **AND** Army JROTC 2 580241

Recommended Grade Level: 11

Recommended Credit: 1

Students will:

1. Identify Foundations of Army Foundations.
2. Identify how Army JROTC can impact your future.
3. Explain the mission of the Army JROTC.
4. Demonstrate the ability to use decision-making skills to enhance health.
5. Demonstrate protocol to show respect for and handling of the United States flag.
6. Demonstrate employability and social skills relative to the career cluster including cell phone, internet etiquette, introductions, and grammar.
7. Comprehend concepts to know how to lead by leading by example.
8. Compare and contrast positive and negative characteristics of being a leader.
9. Demonstrate the ability to use study skills.
10. Perform wellness, fitness, and first aid.
11. Achieve a healthy lifestyle by understanding that you are what you eat and the proper nourishment of the body.
12. Study the history and how the U.S. military has been involved in making our Nation's history.
13. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
14. Demonstrate citizenship lessons by performing public service projects throughout the area.
15. Demonstrate advanced skills using a database program to create enhanced reports.
16. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.
17. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
18. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
19. Learn how to read topographic maps and land navigation.
20. Participate in Leadership challenge and Academic Bowl (JLAB).
21. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
22. Participate in JROTC Raider Challenge, a competitive program in five different Fitness and Skills events.
23. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.

24. Perform in drill formations, regulations, and exhibition/pageantry categories for drill competitions.

Army JROTC 4 580243

This is the fourth course in a four-course sequence that will discuss diet, exercise, and drug awareness and introduces cadets to first aid.

Prerequisites: Army JROTC 1 580240, Army JROTC 2 580241, **AND** Army JROTC 3 580242

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Maximize potential for success through learning and self-management.
2. Correlate the rights and responsibilities of citizenship to the purpose of U.S. government.
3. Describe the mission of various types of military organizations.
4. Demonstrate the ability to use decision-making skills to enhance health.
5. Demonstrate protocol to show respect for and handling of the United States flag.
6. Demonstrate employability and social skills relative to the career cluster including cell phone, internet etiquette, introductions, and grammar.
7. Demonstrate leadership potential as a role model, management skills, and instructor assistant.
8. Demonstrate understanding of the importance of goal setting, providing feedback, and developing processes in both coaching and mentoring.
9. Build effective relationships with peers, co-workers, and the community.
10. Demonstrate the ability to use study skills.
11. Perform drug prevention and interventions.
12. Describe the importance of diet and physical activity in maintaining good health and appearance.
13. Demonstrate proficiency in first aid, CPR, and AED.
14. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
15. Demonstrate citizenship lessons by performing public service projects throughout the area.
16. Apply physical and political geography to building global awareness and exploring the world.
17. Analyze the contributions of military history as it relates to the future.
18. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
19. Research and analyze career opportunities, participate in a job interview, and development an employment portfolio including letter of application, resume, and follow-up letter.
20. Apply problem-solving and decision making processes to supervision.
21. Participate in Leadership challenge and Academic Bowl (JLAB).
22. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
23. Participate in JROTC Raider Challenge, a competitive program in five different Fitness and Skills events.

24. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
25. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Army JROTC Leadership 580244

This class is intended to challenge students who have completed or are in the process of completing their fourth year Army JROTC curriculum and desire advanced study of military subjects. The course provides students with an additional opportunity to hone military leadership skills.

Prerequisites: Army JROTC 1 580240, Army JROTC 2 580241, Army JROTC 3 580242, **AND** Army JROTC 4 580243

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Develop a personal exercise program.
2. Correlate the rights and responsibilities of citizenship to the purpose of U.S. government.
3. Describe the mission of various types of military organizations.
4. Demonstrate the ability to use decision-making skills to enhance health.
5. Demonstrate protocol to show respect for and handling of the United States flag.
6. Demonstrate employability and social skills relative to the career cluster including cell phone, internet etiquette, introductions, and grammar.
7. Demonstrate leadership potential as a role model, management skills, and instructor assistant.
8. Understand the importance of goal setting, providing feedback, and developing processes in both coaching and mentoring.
9. Build effective relationships with peers, co-workers, and the community.
10. Demonstrate the ability to use study skills.
11. Perform drug prevention and interventions.
12. Describe the importance of diet and physical activity in maintaining good health and appearance.
13. Demonstrate proficiency in first aid, CPR and AED.
14. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
15. Demonstrate citizenship lessons by performing public service projects throughout the area.
16. Apply physical and political geography to building global awareness and exploring the world.
17. Analyze the contributions of military history as it relates to the future.
18. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
19. Research and analyze career opportunities, participate in a job interview, and development an employment portfolio including letter of application, resume, and follow-up letter.
20. Apply problem-solving and decision making processes to supervision.
21. Participate in Leadership challenge and Academic Bowl (JLAB).

22. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
23. Participate in JROTC Raider Challenge, a competitive program in five different Fitness and Skills events.
24. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
25. Perform in drill formations, regulations, and exhibition categories for drill competitions.
26. Provide lesson plans, unit plans for younger cadets.

Marine Corps JROTC 1 580320

This is the first course in a four-course sequence to provide cadets with an introduction to both leadership and citizenship. The first year also gives the new cadets exposure to personal growth and responsibility and establishes a foundation of military structure and tradition.

Recommended Grade Level: 9

Recommended Credit: 1

Students will:

1. Identify the mission of the U.S. Marine Corps.
2. Analyze the relation between the Marine Corps and the Department of the Navy.
3. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
4. Identify the Marine Corps elements of Combat Power.
5. Comprehend five different categories of instruction, which are leadership, citizenship, personal growth and responsibility, public service and career exploration, and general military subjects.
6. Demonstrate an introduction to leadership and citizenship exposure to personal growth and responsibility.
7. Establish a foundation of military structure and tradition.
8. Demonstrate the ability to use study skills.
9. Perform wellness, fitness, and first aid.
10. Achieve a healthy lifestyle.
11. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
12. Demonstrate knowledge of safety practices, policies, procedures and strategies related to both personal and environmental safety.
13. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
14. Demonstrate citizenship lessons by performing public service projects throughout the area.
15. Demonstrate advanced skills using a database program to create enhanced reports.
16. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.
17. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
18. Research and analyze career opportunities, participate in a job interview, and development an employment portfolio including letter of application, resume, and follow-up letter.
19. Learn the familiarity with the U.S. Marines history, geography, nautical sciences, organization and structure of the Marines.
20. Study the development of leadership potential with the abilities to live and work cooperatively with others.

21. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
22. Participate in the Presidential Fitness Test.
23. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.

Marine Corps JROTC 2 580321

This is the second course in a four-course sequence designed to provide students continued instruction in leadership and citizenship. Students will receive instruction in general military subjects with more structure and tradition than Level I, as well as the introduction of civilian marksmanship training and land navigation training with the map and compass. Additional learning experiences in personal growth and responsibility and citizenship will be provided.

Prerequisite: Marine Corps JROTC 1 580320

Recommended Grade Level: 10

Recommended Credit: 1

Students will:

1. Identify the mission of the U.S. Marine Corps.
2. Analyze the relation between the Marine Corps and the Department of the Navy.
3. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
4. Identify the Marine Corps elements of Combat Power.
5. Comprehend five different categories of instruction, which are leadership, citizenship, personal growth and responsibility, public service and career exploration, and general military subjects.
6. Demonstrate an introduction to leadership and citizenship exposure to personal growth and responsibility as well as the introduction of civilian marksmanship training.
7. Establish a foundation of military structure and tradition.
8. Demonstrate the ability to use study skills.
9. Perform wellness, fitness, and first aid.
10. Demonstrate proper manner to wear uniform, awards, decorations and insignia.
11. Achieve a healthy lifestyle.
12. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
13. Demonstrate knowledge of safety practices, policies, procedures and strategies related to both personal and environmental safety.
14. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
15. Demonstrate citizenship lessons by performing public service projects throughout the area.
16. Demonstrate knowledge of basic military skills such as drill and ceremonies.
17. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.
18. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.

19. Research and analyze career opportunities, participate in a job interview, and development an employment portfolio including letter of application, resume, and follow-up letter.
20. Learn the familiarity with the U.S. Marines history, geography, nautical sciences, organization and structure of the Marines.
21. Study the development of leadership potential with the abilities to live and work cooperatively with others.
22. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
23. Participate in the Presidential Fitness Test.
24. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.

Marine Corps JROTC 3 580322

This is the third course in a four-course sequence to provide cadets the opportunity to use their leadership training as they assume positions of increased authority and responsibility within the program. The course will also include detailed instruction on personal finances, as well as other preparations for life beyond high school.

Prerequisites: Marine Corps JROTC 1 580320 **AND** Marine Corps JROTC 2 580321

Recommended Grade Level: 11

Recommended Credit: 1

Students will:

1. Identify the mission of the U.S. Marine Corps.
2. Analyze the relation between the Marine Corps and the Department of the Navy.
3. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
4. Identify the Marine Corps elements of Combat Power.
5. Comprehend five different categories of instruction, which are leadership, citizenship, personal growth and responsibility, public service and career exploration, and general military subjects.
6. Demonstrate an introduction to leadership and citizenship exposure to personal growth and responsibility as well as the introduction of civilian marksmanship training.
7. Establish a foundation of military structure and tradition.
8. Demonstrate increased authority in the leadership training.
9. Perform wellness, fitness, and first aid.
10. Demonstrate proper manner to wear uniform, awards, decorations and insignia.
11. Achieve a healthy lifestyle.
12. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
13. Demonstrate knowledge of safety practices, policies, procedures and strategies related to both personal and environmental safety.
14. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
15. Demonstrate citizenship lessons by performing public service projects throughout the area.
16. Demonstrate knowledge of basic military skills such as drill and ceremonies.
17. Address a civilian audience on a subject of common knowledge with the Marine program.
18. Develop and critique instructional materials.
19. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
20. Research and analyze career opportunities, participate in a job interview, and development an employment portfolio including letter of application, resume, and follow-up letter.

21. Learn the familiarity with the U.S. Marines history, geography, nautical sciences, organization and structure of the Marines.
22. Study the development of leadership potential with the abilities to live and work cooperatively with others.
23. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
24. Participate in the Presidential Fitness Test.
25. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.

Marine Corps JROTC 4 580323

This is the fourth course in a four-course sequence designed to provide cadets an opportunity to practice what they have learned in previous courses. Cadets will conduct formations and inspections, as well as supervise certain training events with younger cadets and continue to be challenged academically with requirements for research projects, independent studies, and progress reports.

Prerequisites: Marine Corps JROTC 1 580320, Marine Corps JROTC 2 580321, **AND** Marine Corps JROTC 3 580322

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Identify the mission of the U.S. Marine Corps.
2. Analyze the relation between the Marine Corps and the Department of the Navy.
3. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
4. Identify the Marine Corps elements of Combat Power.
5. Comprehend five different categories of instruction, which are leadership, citizenship, personal growth and responsibility, public service and career exploration, and general military subjects.
6. Demonstrate an introduction to leadership and citizenship exposure to personal growth and responsibility as well as the introduction of civilian marksmanship training.
7. Establish a foundation of military structure and tradition.
8. Demonstrate increased authority in the leadership training.
9. Bring together all their previous learning experience in the MJROTC program.
10. Conduct formations and inspections, as well as supervise training events with younger cadets.
11. Continue to be challenged academically with requirements for research projects and independent studies along with progress reports.
12. Demonstrate proper manner to wear uniform, awards, decorations and insignia.
13. Achieve a healthy lifestyle and disease prevention.
14. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
15. Demonstrate knowledge of safety practices, policies, procedures and strategies related to both personal and environmental safety.
16. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
17. Demonstrate citizenship lessons by performing public service projects throughout the area.
18. Demonstrate knowledge of basic military skills such as drill and ceremonies.
19. Address a civilian audience on a subject of common knowledge with the Marine program.
20. Develop and critique instructional materials.

21. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
22. Research and analyze career opportunities, participate in a job interview, and development an employment portfolio including letter of application, resume, and follow-up letter.
23. Learn the familiarity with the U.S. Marines history, geography, map reading, organization and structure of the Marines.
24. Study the development of leadership potential with the abilities to live and work cooperatively with others.
25. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
26. Participate in the Presidential Fitness Test.
27. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.

Marine Corps JROTC Leadership 580324

This class is intended to challenge students who have completed or are in the process of completing their fourth year of Marine Corps JROTC and desire advanced study in military topics. This course provides cadets with an additional opportunity to hone military leadership skills.

Prerequisites: Marine Corps JROTC 1 580320, Marine Corps JROTC 2 580321, Marine Corps JROTC 3 580322, **AND** Marine Corps JROTC 4 580323

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Demonstrate leadership potential as a role model, coach, counselor, management skill and assistant instructor.
2. Assist instructor in previous levels of instructions assigned.
3. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
4. Identify the Marine Corps elements of Combat Power.
5. Comprehend five different categories of instruction, which are leadership, citizenship, personal growth and responsibility, public service and career exploration, and general military subjects.
6. Demonstrate an introduction to leadership and citizenship exposure to personal growth and responsibility as well as the introduction of civilian marksmanship training.
7. Establish a foundation of military structure and tradition.
8. Demonstrate increased authority in the leadership training.
9. Bring together all their previous learning experience in the MJROTC program.
10. Conduct formations and inspections, as well as supervise training events with younger cadets.
11. Continue to be challenged academically with requirements for research projects and independent studies along with progress reports.
12. Demonstrate proper manner to wear uniform, awards, decorations and insignia.
13. Demonstrate knowledge of safety practices, policies, procedures and strategies related to both personal and environmental safety.
14. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
15. Demonstrate citizenship lessons by performing public service projects throughout the area.
16. Demonstrate knowledge of basic military skills such as drill and ceremonies.
17. Address a civilian audience on a subject of common knowledge with the Marine program.
18. Develop and critique instructional materials.
19. Research and analyze career opportunities, participate in a job interview, and development an employment portfolio including letter of application, resume, and follow-up letter.

20. Study the development of leadership potential with the abilities to live and work cooperatively with others.
21. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
22. Participate in the Presidential Fitness Test.
23. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.

Navy JROTC 1 580310

This is the first course in a four-course sequence which provides an introduction to the NJROTC program including leadership, citizenship and the American Government. Introduction to wellness, fitness, and first aid to include diet, exercise and drug awareness will be addressed. Geography, orienteering, survival and map reading skills, financial skills, and introduction to the U.S. Navy will also be covered.

Recommended Grade Level: 9

Recommended Credit: 1

Students will:

1. Identify Foundations of Navy Foundations.
2. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
3. Comprehend concepts to become a leader by using leadership skills.
4. Demonstrate the ability to use study skills.
5. Perform wellness, fitness, and first aid.
6. Achieve a healthy lifestyle.
7. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
8. Study the history of the United States Navy from the colonial period to present.
9. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
10. Demonstrate citizenship lessons by performing public service projects throughout the area.
11. Demonstrate advanced skills using a database program to create enhanced report.
12. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.
13. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
14. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
15. Learn the familiarity with the U.S. Navy Maritime history, geography, nautical sciences, organization and structure of the Navy and the importance of sea power in the growth of the United States as a world leader.
16. Student the development of leadership potential with the abilities to live and work cooperatively with others.
17. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
18. Participate in the Presidential Fitness Test.
19. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
20. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Navy JROTC 2 580311

This is the second course in a four-course sequence designed to further develop the traits of citizenship and leadership. Cadets will be introduced to the technical areas of naval science as well as nautical sciences to include maritime geography, oceanography, meteorology, astronomy, and physical sciences. The role of the U.S. Navy in maritime history and the vital importance of the world's oceans to the continued well-being of the United States will be addressed. The course includes instruction in leadership; introduction to maritime history, including the American Revolution, Civil War, the rise of the U.S. to world power status, World Wars 1 and 2, the Cold War Era and the 1990s and beyond.

Prerequisite: Navy JROTC 1 580310

Recommended Grade Level: 10

Recommended Credit: 1

Students will:

1. Identify Seamanship, an introduction to the general subjects of seamanship that include anchoring and mooring, ship handling, small boats, weather, and ship construction.
2. Study naval science, nautical astronomy, and oceanography.
3. Explain the mission of the U.S. Navy.
4. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
5. Comprehend concepts to become a leader by using leadership skills.
6. Distinguish between the Shore Establishment and Operating Forces.
7. Perform wellness, fitness, and first aid.
8. Achieve a healthy lifestyle.
9. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
10. Study the history of the United States Navy from the colonial period to present.
11. Learn about the U.S. Constitution and the responsibilities and rights of being a citizen.
12. Demonstrate citizenship lessons by performing public service projects throughout the area.
13. Demonstrate advanced skills using a database program to create enhanced reports.
14. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.
15. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
16. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
17. Learn the familiarity with the U.S. Navy Maritime history, geography, nautical sciences, organization and structure of the Navy and the importance of sea power in the growth of the United States as a world leader.

18. Study the development of leadership potential with the abilities to live and work cooperatively with others.
19. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
20. Participate in the Presidential Fitness Test.
21. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
22. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Navy JROTC 3 580312

This is the third course in a four-course sequence designed to broaden the understanding of students in the operative principles of military leadership, the concept and significance of teamwork, the intrinsic value of good order and discipline in the accomplishment of objectives, and the importance of sea power and national security. Students gain a more in-depth knowledge of naval ships and aircrafts and an introduction to marine navigation and seamanship. The course includes instruction in sea power and national security, naval operations and support functions, military law, and international law and the sea. It provides an introduction to ship construction and damage control, shipboard organization and watch standing, basic seamanship, marine navigation, and naval weapons and aircraft.

Prerequisites: Navy JROTC 1 580310 **AND** Navy JROTC 2 580311

Recommended Grade Level: 11

Recommended Credit: 1

Students will:

1. Identify Seamanship—an introduction to the general subjects of seamanship that include anchoring and mooring, ship handling, small boats, weather, and ship construction.
2. Study sea power and national security, naval operations and support functions, Military and International law and the sea.
3. Explain the mission of the U.S. Navy.
4. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
5. Comprehend ongoing instruction in leadership, citizenship, and discipline.
6. Analyze introduction to ship construction and damage control, basic seamanship, marine navigation, naval weapons and aircraft.
7. Perform wellness, fitness, and first aid.
8. Achieve an appreciation of the importance of physical fitness, proper diet and stress management.
9. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
10. Study the nautical astronomy, a study of astronomy and its application to celestial navigation.
11. Gain a more in-depth knowledge of naval ships and aircraft, an introduction to marine navigation and seamanship.
12. Demonstrate citizenship lessons by performing public service projects throughout the area.
13. Demonstrate advanced skills using a database program to create enhanced reports.
14. Demonstrate advanced skills using presentation software to include diagrams, color and graphic modifications, animation schemes, custom backgrounds, action buttons, hyperlinks, sound, video, and speaker notes.

15. Demonstrate advanced skills using word processing, spreadsheet, database, and presentation software to complete workgroup collaboration to include inserting and reviewing comments.
16. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
17. Learn the familiarity with the U.S. Navy Maritime history, geography, nautical sciences, organization and structure of the Navy and the importance of sea power in the growth of the United States as a world leader.
18. Study the development of leadership potential with the abilities to live and work cooperatively with others.
19. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
20. Participate in the Presidential Fitness Test.
21. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
22. Perform in drill formations, regulations, and exhibition categories for drill competitions.

Navy JROTC 4 580313

This is the fourth course in a four-course sequence focused on practical leadership techniques and implementation. The course includes instruction in theoretical and applied aspects of leadership, training, and evaluation of performance. Students will become aware of the techniques used to create motivation, develop goals and activities for a work group, and the proper ways to set a leadership example.

Prerequisites: Navy JROTC 1 580310, Navy JROTC 2 580311, **AND** Navy JROTC 3 580312

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Identify Seamanship, an introduction to the general subjects of seamanship that include anchoring and mooring, ship handling, small boats, weather, and ship construction.
2. Study sea power and national security, naval operations and support functions, Military and International law and the sea.
3. Focus primarily on practical leadership techniques and implementation.
4. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
5. Assist seniors in understanding leadership and improving their leadership skills by putting them in positions of leadership, under supervision.
6. Analyze their leadership reasons for varying degrees of success throughout the year.
7. Perform wellness, fitness, and first aid.
8. Achieve an appreciation of the importance of physical fitness, proper diet and stress management.
9. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
10. Study the nautical astronomy, a study of astronomy and its application to celestial navigation.
11. Gain a more in-depth knowledge of naval ships and aircraft, an introduction to marine navigation and seamanship.
12. Demonstrate citizenship lessons by performing public service projects throughout the area.
13. Demonstrate techniques used to create motivation, develop goals and activities for a work group.
14. Perform reading assignments, classroom presentations, and practical work with younger cadets.
15. Mentor and guide in their preparation for life after high school to include college preparation, scholarship applications, and the variety of choices that are available to them.
16. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.

17. Learn the familiarity with the U.S. Navy Maritime history, geography, nautical sciences, organization and structure of the Navy and the importance of sea power in the growth of the United State as a world leader.
18. Study the development of leadership potential with the abilities to live and work cooperatively with others.
19. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
20. Participate in the Presidential Fitness Test.
21. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
22. Perform in drill formations, regulations, and exhibition categories for drill competitions.
23. Apply problem-solving and decision making processes to supervision.

Navy JROTC Leadership 580314

This course is intended to challenge students who have completed or are in the process of completing their fourth year of Navy JROTC and desire advanced study in military topics. This course is focused on practical leadership techniques and implementation. The course includes instruction in theoretical and applied aspects of leadership, training, and evaluation of performance. Students will become aware of the techniques used to create motivation, develop goals and activities for a work group, and the proper ways to set a leadership example.

Prerequisites: Navy JROTC 1 580310, Navy JROTC 2 580311, Navy JROTC 3 580312, **AND** Navy JROTC 4 580313

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Identify Seamanship, an introduction to the general subjects of seamanship that include anchoring and mooring, ship handling, small boats, weather, and ship construction.
2. Demonstrate an understanding of the importance of high school graduation to a successful future.
3. Study sea power and national security, naval operations and support functions, Military and International law and the sea.
4. Relate skills and abilities to possible career pathways.
5. Practice professionalism in punctuality, appropriate dress, task completion, and apply good personal grooming habits.
6. Focus primarily on practical leadership techniques and implementation.
7. Demonstrate an understanding of, and an appreciation for, what it means to be a productive and respected citizen of the United States.
8. Assist underclassmen in understanding leadership and improving their leadership skills by putting them in positions of leadership, under supervision.
9. Analyze leadership reasons for varying degrees of success throughout the year.
10. Work with diverse people by being flexible and open-minded.
11. Respect diversity by demonstrating respect for, listening to, and considering.
12. Perform wellness, fitness, and first aid.
13. Achieve an appreciation of the importance of physical fitness, proper diet and stress management.
14. Demonstrate the ability to think logically and communicate effectively both orally and in writing.
15. Study the nautical astronomy, a study of astronomy and its application to celestial navigation.
16. Gain a more in-depth knowledge of naval ships and aircraft, an introduction to marine navigation and seamanship.
17. Demonstrate citizenship lessons by performing public service projects throughout the area.

18. Demonstrate techniques used to create motivation, develop goals and activities for a work group.
19. Perform reading assignments, classroom presentations, and practical work with younger cadets.
20. Mentor and guide in their preparation for life after high school to include college preparation, scholarship applications, and the variety of choices that are available to them.
21. Research and analyze career opportunities, participate in a job interview, and develop an employment portfolio including letter of application, resume, and follow-up letter.
22. Learn the familiarity with the U.S. Navy Maritime history, geography, nautical sciences, organization and structure of the Navy and the importance of sea power in the growth of the United State as a world leader.
23. Study the development of leadership potential with the abilities to live and work cooperatively with others.
24. Attend STEM (Science, Technology, Engineering, and Mathematics) Camp.
25. Participate in the Presidential Fitness Test.
26. Promote teamwork, self-confidence, and marksmanship skills in a marksmanship program.
27. Perform in drill formations, regulations, and exhibition categories for drill competitions.
28. Apply problem-solving and decision making processes to supervision.

LAW AND PUBLIC SAFETY

LAW, PUBLIC SAFETY, CORRECTIONS AND SECURITY CAREER PATHWAYS

Corrections CIP 43.0102.00

The program prepares students to study the theories and principles of correctional science and to function as professional corrections officers and other workers in public and/or private incarceration facilities.

BEST PRACTICE COURSES

Complete (2) two credits from the following:

- 461044 Introduction to Criminal Justice
- 461037 Correctional Systems

Choose (2) two credits from the following:

- 461018 Health and Well-Being for Law Enforcement
- 461043 Criminal Investigation
- 461011 Basic Telecommunications
- 461042 Basic Security Services

Homeland Security CIP 43.0301.00

Homeland Security focuses on security policy, planning, and operations dedicated to the protection of the U.S. territory, assets, infrastructure, institutions and citizens from external threats. It includes instruction in national security policy, government relations, intelligence, law enforcement, security technology, communications and information technology, homeland security planning and operations, disaster planning and applications to specific threat scenarios.

BEST PRACTICE COURSES

Complete (2) two credits from the following:

- 461038 Introduction to Homeland Security
- 461013 Emergency Management

Choose (2) two credits from the following:

- 461039 Terrorism and Counterterrorism Operations
- 461040 Critical Infrastructure Protection
- 461011 Basic Telecommunications
- 461045 Law Enforcement
- 461043 Criminal Investigation
- 461033 Introduction to Fire Service
- 461032 Firefighting Basic Skills I

Law Enforcement Services CIP 43.0107.00

Law Enforcement Services prepares individuals to perform the duties of police and public security officers, including patrol and investigative activities, traffic control, crowd control and public relations, witness interviewing, evidence collection and management, basic crime prevention methods, weapon and equipment operation and maintenance, report preparation, communicating with the public, and other routine law enforcement responsibilities.

BEST PRACTICE COURSES

Complete (3) three credits from the following:

- 461044 Introduction to Criminal Justice
- 461045 Law Enforcement
- 461018 Health and Well-Being for Law Enforcement

Choose (1) one credit from the following:

- 461043 Criminal Investigation
- 461037 Correctional Systems
- 461011 Basic Telecommunications
- 461042 Basic Security Services
- 461038 Introduction to Homeland Security
- 461039 Terrorism and Counterterrorism Operations
- 461013 Emergency Management

Pre-Law Studies CIP 22.0001.00

Students will obtain skills in preparation for legal careers in law firms, courtrooms, government, and businesses. Instruction will cover legal vocabulary and ethics, the philosophy and history of criminal justice, effective and persuasive communications (oral and written), and the state and federal court systems.

BEST PRACTICE COURSES

Complete (2) two credits from the following:

- 461051 Introduction to Law
- 461020 Criminal Law and Procedure

Complete (2) two credits from the following:

- 461019 Civil Law and Procedure
- 461052 Trial Advocacy
- 461049 Appellate Advocacy
- 461047 Advanced Legal Practice
- 461050 Constitutional Law and Civil Rights
- 461048 Alternative Dispute Resolution
- 461044 Introduction to Criminal Justice
- 461043 Criminal Investigation
- 070122 Financial Accounting
- 060121 Business Law
- 461098 Special Topics—Pre-Law **OR** 461095 Internship (Pre-Law) **OR** 461097 Co-op (Pre-Law)

LAW, PUBLIC SAFETY, CORRECTIONS AND SECURITY COURSES

Advanced Legal Practice 461047

Advanced Legal Practice is a project-based capstone course. Students will continue to develop their legal research, writing, and oral advocacy skills by working to resolve legal issues for mock clients.

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Identify and implement different attorney fee structures.
2. Demonstrate understanding of and draft legal pleadings, discovery and legal motions.
3. Resolve legal issues.
4. Execute proper law firm management and collaboration skills.
5. Interview and correspond with a client.
6. Conduct legal research.
7. Draft legal memorandum.
8. Demonstrate client advocacy skills.
9. Organize a career portfolio to document knowledge, skills, and experiences in the legal field.
10. Draft a resume.
11. Prepare for and participate in a mock job interview.
12. Demonstrate appropriate verbal, listening, and writing skills to communicate clearly.
13. Use problem-solving and critical-thinking skills to respond to legal issues.
14. Apply law to fact patterns.
15. Prepare for and participate in student-led discussions/debates.
16. Demonstrate effective organization skills.
17. Demonstrate an understanding of professional responsibility and ethics.
18. Demonstrate proper use of technology to gather, evaluate, use, and present legal arguments.

Alternative Dispute Resolution 461048

This course is designed to provide students with a comprehensive overview of dispute resolution processes and techniques that act as a means for disagreeing parties to come to an agreement short of litigation. Upon successful completion of this course, students will have developed the skills necessary to participate in, and manage a successful arbitration, mediation, and negotiation. Critical analysis and communication skills will be emphasized as an integral part of this course.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Identify and assess sources of conflict.
2. Define mediation, arbitration, and negotiations. Identify their usefulness as problem-solving techniques.
3. Select a conflict management style appropriate for resolution of identified conflicts.
4. Develop essential mediation skills of active listening, speaking, and offering solutions.
5. Exhibit improved emotional control.
6. Exhibit improved questioning, reframing, and summarizing skills.
7. Exhibit improved teamwork and collaboration skills.
8. Exhibit improved decision-making ability and confidence.
9. Initiate appropriate responses in common mediation scenarios.
10. Analyze and practice the steps of the mediation process.
11. Identify the participants in a mediation process, a negotiation, and an arbitration.
12. Draft a written settlement agreement.
13. Negotiate an agreement between disagreeing parties.
14. Manage a successful mediation between disagreeing parties.
15. Identify legal considerations, ethical issues, confidentiality, and evidence concerns in ADR (Alternative Dispute Resolution) processes.
16. Demonstrate appropriate verbal, listening, and writing skills to communicate clearly.
17. Use problem-solving and critical-thinking skills to respond to legal issues.
18. Demonstrate proper use of technology to gather, evaluate, use and present legal arguments.

Appellate Advocacy 461049

This course focuses on appellate advocacy in both civil and criminal cases. After reviewing the principles of trial procedure and how these principles affect appellate work, students will examine the appellate process. Topics covered include the trial record, appellate briefing, oral argument, and application for discretionary appeal.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Explain how issue preservation at the trial court affects appellate review.
2. Summarize the structure of state and federal appellate courts.
3. Describe the selection process for appellate judges in state and federal courts.
4. Compare the standards of appellate review.
5. Identify the role of precedent in appellate decisions.
6. Analyze appellate arguments and brief a legal case.
7. Identify the two-part *Strickland* test for ineffective assistance.
8. Defend a legal position through oral argument, including responding to questions from the bench.
9. Evaluate appellate arguments and justify appellate rulings.
10. Prepare applications for discretionary appeal.
11. Identify the types of claims filed on habeas corpus (conviction, sentence, conditions of confinement, parole, credits, prison discipline).
12. Complete and evaluate a habeas corpus application.
13. Conduct habeas corpus hearings, including direct and cross examination of relevant witnesses.
14. Demonstrate proper use of technology to gather, evaluate, use and present legal arguments.

Basic Security Services 461042

This course includes the history and philosophy of security, nature and impact of security, an overview of security systems, concepts and skills for security officers, security applications, and security of the future.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Identify the functions of specific types of security agencies, officers, and investigators.
2. Identify differences between the legal authority of police officers and security officers.
3. Identify the lawful civil authority of security officers.
4. Explain how constitutional law applies to arrest, search, and seizure by security officers.
5. Define security procedures for fire protection, safety, and emergency planning.
6. Demonstrate physical security and defenses.
7. Compare and contrast security issues related to law enforcement and private security.
8. Demonstrate knowledge of intrusion and access controls.
9. Demonstrate knowledge of loss protection principles and techniques.
10. Identify security applications in retail businesses.
11. Identify the principles of computer security.
12. Define institutional security.

Basic Telecommunications 461011

This course is a study of basic emergency communications and of the federal and state laws that govern these communications, telephone and radio communications systems, communication documentation, emergency management, 911, stress and crisis management.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Identify employment opportunities in the field of emergency communications.
2. Demonstrate effective oral and written communication skills with individuals from varied cultures.
3. Use appropriate technology in emergency communications.
4. Investigate the federal, state, and local communications rules and regulations which govern the operation of emergency communications systems.
5. Explain the concept of 911 and computer-aided dispatch (CAD).
6. Identify the information maintained by state and national crime information center.
7. Explain the objectives of dispatching law enforcement, fire, and medical personnel.
8. Define terminology and conditions related to common medical emergencies such as shock, abdominal pain, burns, chest pain, diabetes, electrocution, drowning, neurological disorders, respiratory distress, obstetrical emergencies, and pediatric emergencies.
9. Demonstrate proper telephone and radio procedures in emergency and non-emergency situations.
10. Prepare written reports, logs, and records needed in emergency situations.
11. Recite the police phonetic alphabet.
12. Respond to inquiries, complaints, and recommendations from the public in mock situations.
13. Demonstrate how to make referrals.
14. Describe procedures for handling crises.
15. Identify types of disasters and the procedures for requesting assistance in each case.
16. Compare CHEMTREC (Chemical Transportation Emergency Center) and CAMEO (Computer-Aided Management of Emergency Operations) relating to chemical emergencies.
17. Identify stress factors involved in emergency communications.
18. Participate in a community mock emergency disaster.

Civil Law and Procedure 461019

This course is designed to provide students with a comprehensive overview of civil law, both substantive and procedural. Critical case law analysis will be emphasized as an integral part of the course.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Identify and explain different sources of liability and their defenses.
2. Demonstrate an understanding of contract law, property law, probate law, tort law, family law, and employment law.
3. Demonstrate an understanding of ADR (Alternative Dispute Resolution) strategies.
4. Demonstrate an understanding of professional responsibility and ethics.
5. Apply appropriate verbal, listening and writing skills to communicate clearly.
6. Use problem-solving and critical-thinking skills to respond to legal issues.
7. Analyze and brief a legal case.
8. Apply law to fact patterns.
9. Prepare for and participate in student-led discussions/debates.
10. Demonstrate effective organization skills.
11. Conduct legal research.
12. Demonstrate proper use of technology to gather, evaluate, use, and present legal arguments.

Constitutional Law and Civil Rights 461050

This course focuses on the U.S. Constitution and federal anti-discrimination laws. Topics covered include judicial review, the legal relationship between the federal government and states, the legal relationship between the branches of the federal government, and protection of individuals and organizations by the Bill of Rights, the Fourteenth Amendment, and federal anti-discrimination laws.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate an understanding of the judiciary's power to interpret the Constitution.
2. Identify the powers of the federal government.
3. Identify the limitations on the exercise of state powers.
4. Explain executive privilege and immunity.
5. Compare and contrast ripeness and mootness.
6. Explain judicial appointment procedures.
7. Explain standing.
8. Compare and contrast procedural due process and substantive due process.
9. Analyze and apply the protections of the Fourteenth Amendment.
10. Apply equal protection analysis.
11. Analyze and apply the protection of the First Amendment.
12. Demonstrate an understanding of protected classes.
13. Analyze Section 1983 Litigation.
14. Demonstrate proper use of technology to gather, evaluate, use, and present legal arguments.

Co-op (Pre-Law) 461097

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screenings.

Prerequisite: Successful completion of at least (3) three courses in the Pre-Law Pathway

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Develop written and oral communication skills.

Co-op (Public Services/Protective Services) 461096

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screenings.

Prerequisite: Successful completion of at least (3) three courses in the pathway.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Develop written and oral communication skills.

Correctional Systems 461037

The function of custodial staff is examined with emphasis on the correctional officer. Institutional procedures are reviewed including reception, classification, program assignment and release procedures.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Discuss careers available within the various correctional systems (local, state, and federal).
2. Identify characteristics of a successful corrections worker.
3. Demonstrate effective oral and written communication skills with individuals from varied cultures including fellow workers, management, citizens, detainees, and inmates.
4. Read and interpret appropriate laws, legal documents, rules, regulations, directives, manuals, and bulletins.
5. Distinguish among federal, state, and local criminal justice agencies in terms of their jurisdiction, authority, and function.
6. Demonstrate an understanding of the functional workings and interrelationship of the major components and sub-components of the criminal justice system.
7. Investigate the security policies and procedures utilized in jails and prisons.
8. Explain the constitutional rights of inmates.
9. Identify the circumstances which subject jail personnel to potential criminal and civil liability.
10. Safely use the tools, materials and equipment commonly used in corrections.
11. Demonstrate or explain the techniques used while receiving inmates such as searching, booking procedures, inventorying personal property, fingerprinting and photographing, and orientation to the facility.
12. Determine procedures for supervision in specialized areas such as kitchen/dining hall, indoor and outdoor recreational facilities, library, church, and work places.
13. Analyze how corrections workers respond to disturbances, emergencies, complaints, and injuries.

Criminal Investigation 461043

This course includes investigative theory, collection and preservation of evidence, sources of information, procedures for conducting interviews and interrogations, using forensic sciences, and preparing for cases and trials.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Explain the role of officers in civil law enforcement.
2. Justify when and how Fourth Amendment Rights protect a citizen.
3. Describe warrant procedures including when a warrant is justified, how to obtain a warrant, how to properly execute a warrant, and what the limitations are for a warrant search.
4. Perform a successful suspect detainment following lawful procedures including arrest, stop and frisk, and force situations.
5. Identify steps to execute a warrantless search based on the Law of Consent, Plain View, Exigent Circumstances, and Search Incident to Arrest.
6. Describe how to execute a lawful automobile stop and search.
7. Perform mock questioning of a suspect in compliance with Miranda Law.
8. Demonstrate the ability to communicate common emergency phrases in Spanish, sign language, and other languages.
9. Determine the appropriate charge for a criminal act based on statutory law.
10. Demonstrate how to document a crime scene.
11. Determine techniques used in handling various crimes such as homicide, assault, sex offenses, and robberies.
12. Analyze, through simulation, corpse, fingerprint, blood spatter, fiber, and hair evidence to determine who committed a crime.
13. Collect and analyze DNA results.
14. Participate in at least one authentic experience—autopsy, clinical forensics lab, child/spouse abuse unit, mental institution.
15. Write reports related to investigations, interviews, and findings.

Criminal Law and Procedure 461020

This course is designed to provide students with an overview of criminal law, both substantive and procedural. Upon successful completion of this course, students will have acquired an understanding of the criminal prosecutorial process, while also learning the elements of individual crimes. In addition, students will have gained an appreciation for the balance of personal accountability with constitutionally-protected rights.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Identify the goals of the American criminal justice system.
2. Demonstrate an understanding of the criminal prosecution process.
3. Demonstrate an understanding of the 4th Amendment.
4. Demonstrate an understanding of the elements needed to convict for a particular crime.
5. Identify the elements of individual crimes against persons.
6. Identify the elements of individual crimes against property.
7. Demonstrate an understanding of the 5th Amendment.
8. Demonstrate an understanding of the 8th Amendment.
9. Demonstrate an understanding of the 6th Amendment.
10. Identify and apply criminal defenses.
11. Demonstrate an understanding of 14th Amendment applications in criminal law settings.
12. Define and explain the concept of due process.
13. Distinguish standards of proof (reasonable suspicion, probably cause/preponderance of the evidence, clear and convincing evidence, and beyond a reasonable doubt).
14. Analyze and interpret statutes.
15. Analyze and brief a legal case.
16. Identify various types of digital and cyber crimes.
17. Demonstrate proper use of technology to gather, evaluate, use and present legal arguments.

Critical Infrastructure Protection 461040

This course focuses on the design, planning and management of systems and procedures for protecting critical, national, physical, and cyber infrastructure from external threats, including terrorism. It includes instruction in homeland security policy, critical infrastructure policy, information security, matrix vulnerability assessment, threat assessment, physical security, personnel security, operational security, contingency planning, case analyzes of specific industries and systems, redundancy planning, emergency and disaster planning, security systems, and intelligence operations.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Define critical infrastructure.
2. Describe who makes up the response workforce for critical infrastructure failures or threats to critical infrastructure.
3. Analyze and describe the potential effect of extreme emergencies, disasters, or acts of terrorism on infrastructures, including but not limited to transportation, electrical service, telecommunications, fuel, food, water, shelter, and emergency services.
4. Identify potentially hazardous conditions in various types of structures during any emergency response.
5. Evaluate the steps to reduce the risk of damage to critical infrastructure from a natural or man-made disaster.
6. Describe federal regulations, funding, and training opportunities that are in place to assist regional, state, and local governments and private sector businesses and industries with protecting critical infrastructure.

Emergency Management 461013

This is a course focusing on the application of the incident command system model to formulating and implementing effective response to natural and man-made disasters. It includes instruction in contingency planning, hazard and risk assessment, joint operations, law and ethics, emergency response and recovery, event mitigation, emergency rescue and medical operations, incident command, terrorism and national security issues, law enforcement, relief administration, volunteer and citizen coordination, public relations and applications to specific types of incidents.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate the command sequence as a guide to action planning.
2. Demonstrate the ability to develop an emergency action plan which includes appropriate goals and objectives.
3. Identify factors that allow the IC (Incident Command) to evaluate and modify the action plan.
4. Develop an action plan for every initial response incident even though the plan is rarely recorded in written form.
5. Demonstrate the appropriate command sequence for various emergency scenarios.
6. Demonstrate the ability to quickly modify the action plan to adapt to changing conditions.
7. Identify proper communication skills and procedures when issuing directives.
8. Identify safe and effective resources through a well-implemented action plan.
9. Identify the importance of accurate and up-to-date situation status and use that information to forecast what actions and resources will be needed if the initial plan requires modification.
10. Identify record keeping procedures in accordance with Federal Disaster Declaration reimbursement guidelines.

Health and Well-Being for Law Enforcement 461018

This course is designed to give the student an overview of personal fitness and wellness including how to maintain good physical fitness and proper nutrition. The course will also give the student an overview of the warning signs of and how to deal with stress in the law enforcement profession.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Perform physical tasks aligned with the 503 KAR 1:140 peace officer, telecommunication, and court security officer professional standards (bench press, sit-ups, 300 meter run, push-ups, one and five-tenths (1.5) mile run).
2. Discuss proper nutrition for maintaining a healthy lifestyle throughout the career of a law enforcement officer.
3. Develop a personal nutrition plan.
4. Develop a physical fitness plan.
5. Determine physical challenges associated with drug abuse and review testing procedures to identify drug abuse.
6. Discuss polygraph testing as it relates to peace officer certification.
7. Outline stress factors relating to law and public safety occupations.
8. Research emotional cycles including adrenaline dumps and outlets for stress.
9. Research the requirements for peace officer certification.

Internship (Pre-Law) 461095

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the internship program do not receive compensation for their work. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screenings.

Prerequisite: Successful completion of at least (3) three courses in the Pre-Law Pathway.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Develop written and oral communication skills.

Internship (Public Services/Protective Services) 461094

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the internship program do not receive compensation for their work. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screenings.

Prerequisite: Successful completion of at least (3) three courses in the pathway.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Develop written and oral communication skills.

Introduction to Criminal Justice 461044

This course studies the history and philosophy of criminal justice, ethical considerations, definition of crime, the nature and impact of crime, an overview of the criminal justice system including law enforcement, corrections, and the court systems.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Research careers in the criminal justice fields (law enforcement, corrections, security, juvenile justice, and courts) focusing on employability characteristics of a successful employee.
2. Outline the criminal justice process from time of arrest through release from custody.
3. Discuss ethics in criminal justice by all practitioners.
4. Define crime.
5. Describe and differentiate the classifications of crimes in Kentucky, including felonies, misdemeanors, and the possible classes and degrees of each.
6. Analyze crime data (local, state, and national) and determine trends and patterns.
7. Analyze the various explanations of criminal behavior.
8. Understand basic legal terminology used in criminal justice.
9. Demonstrate knowledge of the types, elements, and sources of the laws which define certain acts as crimes in the United States.
10. Research the effect of constitutional law on the criminal justice system.
11. Distinguish among federal, state, and local criminal justice agencies in terms of their jurisdiction, authority, and function.
12. Research procedures in criminal justice such as stare decisis, common law, actus reus, mens rea, strict liability, defenses, due process, and Bill of Rights.
13. Explain and differentiate the role of each court in the judicial system (local, state, and federal courts).
14. Review and use technology available in the court room.
15. Outline pretrial and trial procedures including bail, charging the defendant, and plea bargaining.
16. Examine the intent and goals of sentencing and imposing sentence.
17. Review topics in corrections including probation, fines, house arrest, electronic monitoring, and parole.
18. Discuss the prison culture.
19. Research emerging crimes such as cybercrimes, transnational crimes, green crimes, and corporate crimes.

Introduction to Homeland Security 461038

This course focuses on security policy, planning and operations dedicated to the protection of U.S. territory, assets, infrastructure, institutions and citizens from external threats. It includes instruction in national security policy, government relations, intelligence, law enforcements, security technology, communications and information technology, homeland security planning and operations, disaster planning and applications to specific threat scenarios.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Identify major career options within the homeland security field.
2. Define terrorism.
3. Identify the organizational structure of the U.S. Department of Homeland Security.
4. Identify and explain the role of various federal, state, and local agencies in securing our homeland.
5. Identify and explain the role of the most common national, state, regional, and local disaster preparedness and emergency management agencies.
6. Differentiate between the basic responsibilities of each agency in a homeland security emergency situation.
7. Describe the disaster and post-disaster emotional environment.
8. Identify and distinguish between soft and hard target.
9. Identify and describe operating procedures for a terrorist incident.
10. Identify the most commonly used terrorist weapons.
11. Describe the B-NICE (Biological, Nuclear/Radiological, Incendiary, Chemical, and Explosive Agents) indicators and cues that help identify when a terrorist attack has occurred.
12. Describe the actions to take following a suspected terrorist attack.
13. Define terrorism and how it differs from common criminal acts.
14. Identify major international and domestic terrorist organizations and their respective ideologies.
15. Explain the historical context of current terrorist organizations and historical events of terrorism.
16. Identify and discuss current constitutional law, criminal laws, Presidential Directives, and other relevant regulations related to protecting the homeland.
17. Compare and differentiate between community preparation for natural emergencies and disasters with community preparation for terrorism.

Introduction to Law 461051

This course studies the history, purpose, and function of law. Students will learn about law-related careers, study the major areas of law, gain an understanding of the court system, analyze case law, and study the adversary system.

Recommended Grade Level: 9 - 11

Recommended Credit: 1

Students will:

1. Explore various careers available in the field of law and justice.
2. Explain the structure of the American court system.
3. Describe the structure of federal and state court systems.
4. Identify and explain the various roles of courtroom participants.
5. Demonstrate a basic understanding of state and federal law.
6. Differentiate between major crime types, classes, and degrees.
7. Demonstrate knowledge of constitutional law and the basic protections and restrictions guaranteed by the Bill of Rights.
8. Distinguish standards of proof (reasonable suspicion, probable cause/preponderance of the evidence, clear and convincing evidence, and beyond a reasonable doubt).
9. Explain the impact of precedent.
10. Explore limits to prosecutorial procedure.
11. Explore and examine the pre-trial, trial, and post-trial processes.
12. Demonstrate successful writing and communication skills.
13. Differentiate between civil and criminal laws.
14. Identify the functions of civil and criminal lawsuits.
15. Demonstrate proper use of technology to gather, evaluate, use, and present legal arguments.
16. Discuss the importance of ethics by participants in the legal system.

Law Enforcement 461045

This course trains students to evaluate the powers granted to the police and restrictions placed upon them by respective constitutions and their amendments. Specific topics of discussion will include search and seizure, arrests, interviews, interrogations, and confessions in the context of criminal prosecution. Activities include tactics, methods, and skills utilized in the law enforcement field. Skills will be obtained in basic disaster response.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Apply knowledge of major United States Supreme Court decisions to the role and function of law enforcement.
2. Apply civil law to law enforcement.
3. Demonstrate proficiency in police skills and tactics.
4. Discuss the role of various disaster preparedness/emergency management agencies such as Department of Homeland Security, Federal Emergency Management Agency.
5. Demonstrate the steps of Basic Life Support (BLS).
6. Describe steps to prepare for emergencies from hazards affecting homes and communities.
7. Practice fire safety by understanding the various origins of fire, classes of fires, and correct means to extinguish each type of fire.
8. Identify and treat injuries of victims in a simulated disaster or emergency situation.
9. Analyze the components of an effective search and rescue operation.
10. Evaluate techniques for managing intra-personal reactions to crisis situations to assist in effectively meeting the needs of the victims and rescuers.
11. Explore the responsibilities of law enforcement during incidents of terrorism.
12. Define the role and function of police including patrol, investigation, and support.
13. Demonstrate knowledge and skills related to law enforcement and private security.
14. Demonstrate security policies and procedures used in jails, prisons, and other correctional facilities.
15. Identify current concerns with law enforcement (stress, fatigue, violence and brutality, issues at home such as financial management and divorce rates).
16. Analyze the social and legal issues of use of force.
17. Practice effective written and oral communications.
18. Develop the ability to communicate with all cultures (mentally challenged, non-English speaking, and various religions).
19. Review legal requirements for police procedures such as interrogation, confessions, and search and seizure.

Special Topics—Pre-Law 461098

Special Topics is an expanded course offering the study of current law and public safety issues. Topics may vary at the discretion of the instructor.

Prerequisite: Successful completion of at least (3) three courses in the Pre-Law Pathway.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Complete tasks developed by the instructor related to the project.
2. Practice written and oral communications.

Special Topics—Public Services/Protective Services 461099

Special Topics is an expanded course offering the study of current law and public safety issues. Topics may vary at the discretion of the instructor.

Prerequisite: Successful completion of at least (3) three courses in the pathway.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Complete tasks developed by the instructor related to the project.
2. Practice written and oral communications.

Terrorism and Counterterrorism Operations 461039

This course focuses on the study of terrorism as a global and national threat and the methods for analyzing and countering it. It includes instruction in psychology, cultural studies, terrorist history and organization, terrorist capabilities, terrorist finance and international money-laundering, threat assessment, intelligence operations, incident command systems, border security, emergency response, joint operations, surveillance and communications systems, cyberterrorism, weapons of mass destruction, counterterrorist operations, and applications to specific terrorist organizations and threats.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Define terrorism.
2. Define counterterrorism.
3. Analyze and describe the role of the military, federal, state, and local intelligence agencies in protecting the homeland from terrorist events.
4. Analyze and describe the role of the military, federal, state, and local agencies in responding to acts of terrorism.
5. Describe terrorist strategies and methods.
6. Describe and demonstrate effective responses to acts of terrorism.
7. Describe the geopolitics of terrorism.
8. Analyze and describe terrorist venues.
9. Describe who becomes a terrorist and why.
10. Analyze and describe effective methods for deterring terrorism.
11. Resolve simulated terrorist attacks in table-top and other simulated exercises.
12. Identify and implement all components of NIMS (National Incident Management System).
13. Describe international counterterrorism and the role of the U.S. in foreign countries.
14. Describe counterinsurgency.

Trial Advocacy 461052

This course focuses on trial advocacy in both civil and criminal cases. Topics covered include opening statement and closing argument, direct and cross examination, courtroom decorum, and evidence law. Additionally, this course will prepare students for a competitive mock trial.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Compare the role and composition of a trial jury and a grand jury.
2. Identify the qualifications for a juror.
3. Describe the function and importance of a grand jury in U.S. government.
4. Compare and contrast preliminary hearings and grand jury proceedings.
5. Identify the purpose and function of relevant discovery rules.
6. Distinguish between criminal and civil discovery.
7. Identify available pretrial motions and the function of each.
8. Support and defend legal arguments in pretrial motions.
9. Compose pretrial motions.
10. Describe pretrial procedures.
11. Evaluate and respond to arguments in pretrial motions.
12. Evaluate the practice of plea bargaining.
13. Prepare for trial.
14. Analyze a witness statement, deposition, or affidavit.
15. Analyze pleadings and exhibits.
16. Draft a trial theory and theme.
17. Analyze the jury selection process.
18. Distinguish between peremptory challenges and challenges for cause.
19. Draft and present opening statements and closing arguments.
20. Draft and present witness questions for direct and cross examination.
21. Apply evidence law in a courtroom simulation exercise.
22. Demonstrate an understanding of relevancy law.
23. Demonstrate an understanding of hearsay law.
24. Conduct voir dire in a courtroom simulation exercise.
25. State the proper use of objections (asked and answered, leading, non-responsive, hearsay, relevance, narration, assumes facts, not in evidence, argumentative, lack of foundation, speculation).
26. Object and respond to objections in court.
27. Properly lay a foundation for the introduction of evidence.
28. Participate in a courtroom simulation exercise.
29. Role play as a witness.
30. Demonstrate proper examination techniques.
31. Impeach a witness.
32. Demonstrate proper qualifications of expert witnesses.
33. Explain accepted justifications for criminal punishment.

34. Explain various sentencing options.
35. Distinguish probation and parole.
36. Prepare relevant sentencing documents including sentencing memorandum, exhibits, and affidavits.
37. Argue and defend appropriate sentencing.
38. Demonstrate proper use of technology to gather, evaluate, use and present legal arguments.
39. Define the legal rights of the defendant at trial.
40. Demonstrate proper courtroom decorum.
41. Distinguish the various roles of the participants in the trial process.
42. Evaluate the responsibilities of each participant in the court system.
43. Identify support personnel and other participants within the court system.
44. Analyze and interpret statutes.
45. Conduct advanced legal research.
46. Identify victim rights within the criminal justice process.

FIRE SAFETY CAREER PATHWAYS

Emergency Medical Technology CIP 51.0904.01

This pathway prepares individuals, under the remote supervision of physicians, to recognize, assess, and manage medical emergencies in prehospital settings and to supervise ambulance personnel. Instruction includes basic, intermediate, and advanced EMT (Emergency Medical Technician) procedures; emergency surgical procedures; medical triage; rescue operations; crisis scene management and personnel supervision; equipment operation and maintenance; patient stabilization, monitoring, and care; drug administration; identification and preliminary diagnosis of diseases and injuries; communication and computer operations; basic anatomy, physiology, pathology, toxicology; and professional standards and regulations.

BEST PRACTICE COURSES

Complete (4) four credits:

- 170111 Principles of Health Science
- 170141 Emergency Procedures **AND** 170131 Medical Terminology
- 461022 EMT – First Responder
- 461023 EMS Training

Fire Science/Firefighting CIP 43.0203.00

This pathway will focus on the theory and practice of fires and firefighting. Instruction includes fire chemistry and physics, combustible materials, computer science, building construction, fire codes and related laws, fire hydraulics, fire command, fire prevention/inspection, fire protection systems, fire suppression systems, fire/arson investigation, occupational safety, equipment operation, emergency medicine and communications.

BEST PRACTICE COURSES

Complete (5) five credits:

- 461033 Introduction to Fire Service
- 461032 Firefighting Basic Skills I
- 461034 Firefighting Basic Skills II
- 461031 Firefighting Basic Skills III
- 461036 Firefighting Intermediate Skills I

Choose (1) one or more credits:

- 461066 Firefighting Intermediate Skills II
- 461067 Firefighting Intermediate Skills III
- 461062 Company Officer Development
- 461069 Special Topics in Fire Service
- 461064 Firefighting Advanced Skills I
- 461065 Firefighting Advanced Skills II
- 461063 Co-Op (Fire Service/EMT)
- 461068 Internship (Fire Service/EMT)

FIRE SAFETY COURSES

Company Officer Development 461062

This course involves information and activities that will help the student understand the role of Fire Service Company Officers.

Prerequisites: Introduction to Fire Service 461033 **AND** Firefighting Basic Skills I 461032

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Recognize the company officer's role in fire service.
2. Recall rules for success in fire service.
3. Identify ways of avoiding mistakes as a new company officer.
4. Explain how operational and administrative department members work together to achieve a common goal.
5. State guidelines for handling problems to avoid being sidestepped.
6. Distinguish between discipline and punishment.
7. Identify barriers to effective delegation by matching barriers to problem situations.
8. List keys of effective delegation.
9. Delegate of refer tasks and authority.
10. Define authority.
11. Distinguish between centralized and decentralized authority.
12. List the essential elements of effective communications.
13. List specific examples on communication mediums.
14. Describe the characteristics of a good listener.
15. Give oral directions while demonstrating a process.
16. Define leadership.
17. List the five characteristics of an effective leader.
18. Demonstrate the ability to organize and lead a group session.
19. Explain the company officer's role in motivating employees.
20. Provide examples of positive and negative motivation.
21. Provide examples of effective ways of modifying behavior.
22. Practice leadership skills through mentoring and teaching topics to other students.
23. Practice leadership skills through participation in community events.

Co-Op (Fire Service/EMT) 461063

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screenings.

Prerequisites: Introduction to Fire Service 461033, Firefighting Basic Skills I 461032, Firefighting Basic Skills II 461034, **AND** Firefighting Intermediate Skills I 461036 **OR** Instructor approved acceptable combination.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Develop written and oral communication skills.

EMS Training 461023

Training involves typical anatomy and physiology; patient assessment; care for respiratory and cardiac emergencies; control of bleeding, application of dressing and bandages; treatment for traumatic shock; care for fractures, dislocation, sprains and strains; medical emergencies; emergency childbirth; burns and heat emergencies; environmental emergencies; principles of vehicle rescue; transportation of patient, and general operations of emergency medical services.

Recommended Grade Level: 9 – 12

Recommended Credit: 1 – 6

Students will:

1. Identify the three (3) major roles and responsibilities of the first responder.
2. Describe the legal aspects of providing emergency care.
3. Identify the human systems, including anatomy.
4. Identify the basic mechanics of respiration, signs of airway obstruction and respiratory arrest, maintaining an open airway, pulmonary resuscitation; variations for children and infants; and special consideration for the laryngectomies.
5. Identify comprise of circulation and signs of cardiac arrest.
6. Demonstrate the procedure of cardiopulmonary resuscitation by one rescuer or two rescuers.
7. Demonstrate the use of airway resuscitator devices and airway adjuncts.
8. Describe signs of shock, prevention of shock and treatment of shock.
9. Identify the signs of internal bleeding, external bleeding and demonstrate procedures of bleeding control.
10. Identify the physiology of the skin and classify types of bandages.
11. Demonstrate and practice the application of dressing and bandages.
12. Identify anatomy and physiology of musculoskeletal systems and definitions and types of fractures and dislocations.
13. Demonstrate the techniques of care for fractures and dislocations, sprains, and strains.
14. Identify the signs and symptoms of injury to the pelvis and hip, and demonstrate the emergency care for pelvic and hip injury.
15. Identify anatomy and physiology of the nervous system; signs and symptoms of spinal fractures; general rules of care for patients with spinal injuries; signs of skull fractures; care for skull, brain, face and neck injuries and practice immobilization using extrication collars.
16. Identify functions of the abdomen, genitalia and the chest including techniques of care for these areas.
17. Describe the signs and symptoms of poisoning, bites and medical emergencies relative to these conditions.
18. Describe the signs and symptoms and techniques of care for diabetic, abdominal distress, and substance abuse emergencies including seizures.
19. Identify relative anatomy, physiology and emergency care for emergency childbirth.
20. Identify components of assessing the newborn, care for premature infants, and pediatric emergencies.

21. Identify the degree and classification of burns and care for each classification.
22. Recognize and identify hazardous materials and precautionary procedures.
23. Identify signs and symptoms and correct techniques for heat emergencies, hypothermia and water related emergencies.
24. Identify procedures to deal with abnormal behavior and substance abuse patients.
25. Describe dealing with death and near death situations as a first responder.
26. Identify, demonstrate, and practice the procedures for lifting and transfer of patients.
27. Identify and practice the principles of patient triage.
28. Identify procedures of patient extrication from vehicles.
29. Identify the components of ambulance operations.
30. Identify the components of reports and documents associated with emergency care.
31. Identify communication processes associated with the operations of an Emergency Medical Service System.
32. Identify communicable disease transmission and the universal precautions associated with blood borne and airborne pathogens.

EMT – First Responder 461022

This basic Emergency Medical Technician Course covers all knowledge aspects of trauma care as outlined by national standards, created by federal guidelines, considered to be the responsibilities of ambulance operations. Training involves typical anatomy and physiology; patient assessment; care for respiratory and cardiac emergencies; control of bleeding; application of dressing and bandages; treatment for traumatic shock; care for fractures, dislocation, sprains and strains, medical emergencies; emergency child birth; burns and heat emergencies; environmental emergencies; principles of vehicle rescue; transportation of patients and general operations of ambulance systems.

Recommended Grade Level: 9 – 12

Recommended Credit: 2

Students will:

1. Identify the human systems, including anatomy, physiology and an introduction and practice in patient assessment.
2. Identify the basic mechanics of respiration, signs of airway obstruction and respiratory arrest, maintaining an open airway, pulmonary resuscitation; lavations for children and infants and special conditions for the laryngectomies.
3. Identify the basics of circulation, signs and symptoms of cardiac arrest.
4. Demonstrate the procedure of cardiopulmonary resuscitation by one rescuer and two rescuers.
5. Demonstrate the use of airways, suction equipment, resuscitation devices and airway adjuncts.
6. Describe signs, symptoms, and prevention of shock and treatment of shock.
7. Identify signs of internal bleeding; external bleeding and demonstrate procedures of bleeding control.
8. Identify indicators and contra indicators relative to the use of pneumatic anti-shock garments and provide for practice in their application.
9. Identify the physiology of the skin and types of wound and demonstrate the care of wounds.
10. Demonstrate and practice the application of dressing and bandages.
11. Identify anatomy and physiology of musculoskeletal systems and definitions and types of fractures and dislocations.
12. Demonstrate the techniques of care for fractures and dislocations, sprains and strains.
13. Identify the signs and symptoms of injury to the pelvis and hip and demonstrate the emergency care for pelvic and hip injury.
14. Identify anatomy and physiology of the nervous system; signs and symptoms of spinal fractures; general rules of care for patients with spinal injuries; signs of skull fractures; care for skull, brain, face, and neck injuries; and practice immobilization using extrication collars and splint devices.
15. Identify functions of abdomen, genitalia and the chest including techniques of care of these areas.

16. Describe the signs and symptoms of poisoning, bites, and stings; heart attack; stroke and dyspnea; and the care for medical emergencies relative to these conditions.
17. Describe the signs and symptoms and techniques of care for diabetic, abdominal distress, and substance abuse emergencies including seizures.
18. Identify relative anatomy, physiology and emergency care for emergency childbirth.
19. Identify components of assessing the newborn, care for premature infants, and pediatric emergencies.
20. Identify the degree and classification of burns and care for each classification.
21. Recognize and identify hazardous materials and precautionary procedures.
22. Identify signs and symptoms and correct techniques for heat emergencies, hypothermia and water related emergencies.
23. Describe considerations when dealing with infants, children, elderly and disadvantaged patients.
24. Identify procedures to deal with abnormal behavior and substance abuse patients.
25. Describe dealing with death and near death situations as an EMT (Emergency Medical Technician).
26. Identify, demonstrate, and practice the procedures for lifting and transfer of patients.
27. Identify and practice the principles of patient triage.
28. Identify procedures of patient extrication from vehicles.
29. Identify the components of ambulance operations.
30. Identify the components of reports and documents associated with emergency care.
31. Identify the legal aspects of emergency care.
32. Identify communications processes associated with the operations of an emergency medical service system.
33. Identify communicable disease transmission and the universal precautions associated with blood borne and airborne diseases.
34. Provide for in-hospital observations and training.
35. Provide for field observation of emergency medical care as a member of an ambulance crew.

Firefighting Advanced Skills I 461064

This course provides further expansion of the Firefighting Intermediate Skills I course and includes Kentucky Fire Commission Training topics Z0000 Pumper Operations, CC0000 Drivers Training, A0000 Administration and Organization, FC40000 KY Flashover, F0000 Personal Protective Equipment II, K0000 Fire Hose, and D0000 Fire Behavior.

Prerequisite: Firefighting Intermediate Skills III 461067 **AND** a valid driver's license

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Complete the following tasks for Z0000 Pumper Operations.
   a. Identify the operating principles of single-state and multiple-state centrifugal fire pumps.
   b. Given pump models or diagrams, identify the major components and trace the flow of water through single-state and multiple-state centrifugal pumps.
   c. Identify the percentage of rated capacity, rated pressures, and the capacity in gallons per minutes (GPM) at the rated pressure a fire department pumper is designed to deliver.
   d. Given a fire department pumper and the necessary equipment, demonstrate an annual pumper service test.
   e. Identify the following conditions that may result in possible pumper apparatus damage or unsafe operation: cavitation; leaking fuel, oil or water; overheating; unusual noises; vibrations; and water hammer.
   f. Identify corrective measures for cavitation; leaking fuel, oil or water; overheating; unusual noises; vibrations; and water hammer.
   g. Identify incrustation, tuberculation, and sedimentation, and their effects on the carrying capacities of water mains.
   h. Identify and describe various types of hydrants.
      i. Connection size and type of thread of discharge openings;
      ii. Construction and operation of drain valve;
      iii. Direction of operation of the main valve;
      iv. Internal diameter of hydrant barrel;
      v. Hydrant discharge outlet coefficient; and
      vi. Procedures and policies of hydrant locations.
   i. Identify the available fire flows in various areas.
   j. Identify problems related to flows from dead-end water mains.
   k. Given reference material, identify and explain the approximate pressure-discharge relationship for various water pipe sizes.
2. Complete the following tasks for CC0000 Drivers Training.
   a. Demonstrate the performance of routine tests, inspections, and servicing functions required to assure the operational status of fire department vehicles, including battery,

braking system, coolant system, electrical system, fueling, hydraulic fluids, lubrication, oil levels, tire care, steering system, and tools, appliances, and equipment.

b. Demonstrate the recording and reporting, as specified by the authority having jurisdiction, of all servicing functions.
c. Identify all applicable state and local laws of the authority having jurisdiction, including rules and regulations governing the safe driving and operation of fire department vehicles.
d. Given a fire department vehicle, identify all automotive gauges and demonstrate their usage.
e. Review driving skills needed for certification.
f. Identify and demonstrate the theory and principles of defensive driving techniques, both emergency and non-emergency.
g. Identify all applicable state and local laws, including rules and regulations, governing the safe driving and operation of all fire department vehicles of the authority having jurisdiction, on emergency response.
h. Demonstrate the legal and safe driving, positioning, and operating of assigned fire department vehicles of the authority having jurisdiction in emergency response conditions.
i. Describe the safety precautions necessary when driving during adverse environmental conditions.
j. Describe the effects of braking reaction time, load control factors, and general steering reactions on vehicle control.
k. Perform routine tests, inspections and servicing functions required to assure the operational status of fire department pumpers, including battery check, booster tank level (if applicable), braking system, coolant system, electrical system, hydraulic fluids, fueling, lubrication, oil levels, pumping system, steering systems, tire care, and tools, appliances, and equipment.

3. Complete the following tasks for A0000 Administration and Organization.
   a. Describe the organization of the fire department.
   b. Explain the Firefighters I's role as a member of the organization.
   c. Explain the mission of the fire service and of the local fire department.
   d. Explain the function of Standard Operating Procedures.
   e. Explain fire department rules and regulations that apply to the position of Firefighting.
   f. Explain the components of and the firefighter's role within the local incident management system.
   g. Explain the role of other agencies that may respond to emergencies.
   h. Describe the components of a member assistance program.
4. Complete the following tasks for FC40000 KY Flashover (lecture only).
   a. Recognize the signs of an impending flashover.
   b. Identify and practice techniques for escaping a flashover.
5. Complete the following tasks for F0000 Personal Protective Equipment.
   a. Identify the function of the following articles of protective equipment:
      i. Helmet with eye shield
      ii. Hood
      iii. Boots

iv. Gloves
v. Protective trousers
vi. Protective coats
vii. Self-Contained Breathing Apparatus (SCBA)
viii. Personal Alert Safety System (PASS), and
ix. Eye protection.

b. Identify and demonstrate the care, use, inspection, maintenance, and limitations of the protective clothing and equipment.
c. Demonstrate the donning of protective equipment.
d. Identify hazardous environments that require respiratory protection.
e. Identify the physical requirements of a Self-Contained Breathing Apparatus (SCBA) wearer.
f. Describe the uses and limitations of Self-Contained Breathing Apparatus (SCBA).
g. Identify each component and safety feature of Self-Contained Breathing Apparatus (SCBA).
h. Describe the function of each component of Self-Contained Breathing Apparatus (SCBA).
i. Assure the Self-Contained Breathing Apparatus (SCBA) is in a safe condition for immediate use.
j. Demonstrate the use of Self-Contained Breathing Apparatus (SCBA) under the conditions of obscured visibility and restricted passage.
k. Demonstrate the procedures of Self-Contained Breathing Apparatus (SCBA) use: emergency by-pass valve, conservation of air, regulator breathing, maximum use of air under working conditions, and cylinder replacements.
l. Demonstrate and document routine maintenance for Self-Contained Breathing Apparatus (SCBA), including inspection, cleaning, sanitizing and cylinder recharging.
m. Demonstrate rescue procedures for the following:
    i. A firefighter with functioning respiratory protection;
    ii. A firefighter without functioning respiratory protection; and
    iii. A civilian without respiratory protection.

6. Complete the following tasks for K0000 Hose, Nozzles, and Appliances.
    a. Describe the application of each size and type of hose on a pumper as required to be carried by NFPA (National Fire Protection Association) 1901.
    b. Demonstrate the use of nozzles, adapters and hose appliances and tools on a pumper as required by NFPA (National Fire Protection Association) 1901.
    c. Advance uncharged and charged attack lines of two different sizes of 1 ½ inch or larger, from a pumper, for the following evolutions:
        i. Into a structure;
        ii. Up a ladder to a second floor landing;
        iii. Up an inside stairway to an upper floor;
        iv. Up an outside stairway to an upper floor;
        v. Down an inside stairway to a lower floor;
        vi. Down an outside stairway to a lower floor; and
        vii. To an upper floor by hoisting.
    d. Demonstrate the following given fire hose used for fire attack and water supply.

    i. Three types of hose loads and finishes;
    ii. Three types of hose rolls;
    iii. Coupling and uncoupling two lengths;
    iv. Two hose carries extending hose lines; and
    v. Replacing burst sections of hose.
  e. Demonstrate operations of a charged attack line 1 ½ inch or larger from the ground ladder.
  f. Demonstrate carrying a 100-foot attack line 1 ½ inch or larger into a building, connecting it to a standpipe, and advancing the line from the standpipe.
  g. Demonstrate a hand lay of 300 feet of supply line 2 ½ inch or larger from a pumper to a water source.
  h. Define a fire stream.
  i. Define water hammer and at least one method of its prevention.
  j. Demonstrate how to open and close a nozzle and how to adjust its stream pattern and flow setting, when applicable.
  k. Identify the type, design, operation, required nozzle pressure, and flow of a given selection of nozzles and tips.
  l. Define the following methods of water application: direct, indirect, combination.
  m. Identify precautions to be followed when advancing hose lines to a fire.
  n. Identify three observable results that are obtained when the proper application of a fire stream is accomplished.
7. Complete the following tasks for D0000 Fire Behavior.
  a. Define fire.
  b. Define fire triangle and tetrahedron.
  c. Recognize the various conditions related to three (3) stages and three (3) conditions of fire and their associated hazards.
  d. Identify three products of combustion found in structural fires that create life hazards.
  e. Define the three methods of heat transfer.
  f. Define the three physical states of matter in which fuels are commonly found.
  g. Define the relationship of the concentrations of oxygen to combustibility and life safety.
  h. Describe the process of thermal layering that occurs in structural fires and how to avoid disturbing the normal layering of heat.

Firefighting Advanced Skills II 461065

This course provides further expansion of the Firefighting Intermediate Skills II course and includes Kentucky Fire Commission Training topics D0000 Fire Behavior, K0000 Fire Hose, I0000 Ropes, G0000 Forcible Entry, and F0000 Personal Protective Equipment.

Prerequisites: Firefighting Intermediate Skills II 461066 **AND** Firefighting Advanced Skills I 461064

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Complete the following tasks for D0000 Fire Behavior.
   a. Define fire.
   b. Define fire triangle and tetrahedron.
   c. Recognize the various conditions related to three (3) stages and three (3) conditions of fire and their associated hazards.
   d. Identify three products of combustion found in structural fires that create life hazards.
   e. Define the three methods of heat transfer.
   f. Define the three physical states of matter in which fuels are commonly found.
   g. Define the relationship of the concentrations of oxygen to combustibility and life safety.
   h. Describe the process of thermal layering that occurs in structural fires and how to avoid disturbing the normal layering of heat.
2. Complete the following tasks for K0000 Hose, Nozzle, and Appliances
   a. Describe the application of each size and type of hose on a pumper as required to be carried by NFPA (National Fire Protection Association) 1901.
   b. Demonstrate the use of nozzles, adapters and hose appliances and tools on a pumper as required by NFPA (National Fire Protection Association) 1901.
   c. Advanced uncharged and charged attack lines of two different size of 1 ½ inch or larger, from a pumper, for the following evolutions:
      i. Into a structure;
      ii. Up a ladder to a second floor landing;
      iii. Up an inside stairway to an upper floor;
      iv. Up an outside stairway to an upper floor;
      v. Down an inside stairway to a lower floor;
      vi. Down an outside stairway to a lower floor; and
      vii. To an upper floor by hoisting.
   d. Demonstrate the following given fire hose used for fire attack and water supply:
      i. Three types of hose loads and finishes;
      ii. Three types of hose rolls;
      iii. Coupling and uncoupling two lengths;
      iv. Two hose carries extending hose lines; and
      v. Replacing burst sections of hose

e. Demonstrate operations of a charged attack line 1 ½ inch or larger from ground ladder.
f. Demonstrate carrying a 100-foot attack line 1 ½ inch or larger into a building, connecting it to a standpipe, and advancing the line from the standpipe.
g. Demonstrate a hand lay of 300 feet of supply line 2 ½ inch or larger from a pumper to a water source.
h. Define a fire stream.
i. Define water hammer and at least one method of its prevention.
j. Demonstrate how to open and close a nozzle and how to adjust its stream pattern and flow setting, when applicable.
k. Identify the type, design, operation, required nozzle pressure, and flow of a given selection of nozzles and tips.
l. Define the following methods of water application: direct, indirect, combination.
m. Identify precautions to be followed while advancing hose line to a fire.
n. Identify three observable results that are obtained when the proper application of a fire stream is accomplished.

3. Complete the following tasks for I0000 Ropes.
   a. Explain the uses of and tie a bowline knot, a clove hitch, figure of eight on the bight, a Becket bend, overhand safety knot, and half-hitch, given the proper size and amount of rope.
   b. Tie an approved knot and hoist any selected forcible entry tool, pike pole/hook, ground ladder, hose line extinguisher, or appliance to a height of at least 12 feet, 3 inches given the proper rope.
   c. Demonstrate the procedures of inspection, maintaining and storing rope.
   d. Use a rope to tie ladders, hose, and other objects to secure them.
   e. Distinguish between life and safety and utility ropes.
4. Complete the following tasks for G0000 Forcible Entry.
   a. Identify materials and construction features of doors, windows, and walls and the dangers associated with forcing entry through each.
   b. Force entry through at least 3 different types of doors, windows, and walls.
   c. Identify materials and construction features of door and window locking devices.
   d. Identify the method and demonstrate procedures of through-the-lock entry for doors and windows.
   e. Identify methods and procedures for cleaning, maintaining, and inspecting hand tools used for forcible entry.
   f. Identify and safely carry at least one of the following: cutting tool, prying tool, pulling tool, striking tool.
5. Complete the following tasks for F0000 Personal Protective Equipment.
   a. Identify the function of the following articles of protective equipment:
      i. Helmet with eye shield
      ii. Hood
      iii. Boots
      iv. Gloves
      v. Protective trousers
      vi. Protective coats
      vii. Self-Contained Breathing Apparatus (SCBA)

viii. Personal Alert Safety System (PASS), and
ix. Eye protection.

b. Identify and demonstrate the care, use, inspection, maintenance, and limitations of the protective clothing and equipment.
c. Demonstrate the donning of protective equipment.
d. Identify hazardous environments that require respiratory protection.
e. Identify the physical requirements of a Self-Contained Breathing Apparatus (SCBA) wearer.
f. Describe the uses and limitations of Self-Contained Breathing Apparatus (SCBA).
g. Identify each component and safety features of Self-Contained Breathing Apparatus (SCBA).
h. Describe the function of each component of Self-Contained Breathing Apparatus (SCBA).
i. Assure that Self-Contained Breathing Apparatus (SCBA) is in a safe condition for immediate use.
j. Demonstrate the use of Self-Contained Breathing Apparatus (SCBA) under conditions of obscured visibility and restricted passage.
k. Demonstrate the procedures for Self-Contained Breathing Apparatus (SCBA) use: emergency by-pass valve, conservation of air, regulator breathing, maximum use of air under working conditions, and cylinder replacements.
l. Demonstrate and document routine maintenance for Self-Contained Breathing Apparatus (SCBA), including inspection, cleaning, sanitizing and cylinder recharging.
m. Demonstrate rescue procedures for the following:
    i. A firefighter with functioning respiratory protection;
    ii. A firefighter without functioning respiratory protections; and
    iii. A civilian without respiratory protection.

Firefighting Basic Skills I 461032

This course includes Kentucky Fire Commission Training topics I0000 Ropes, J0000 Ladders, W0000 Aircraft Rescue, Q0000 Rescue, P0021 First Aid, P0002 Blood Borne Pathogens, X0000 Emergency Disaster Planning, G0000 Forcible Entry, and P0001 CPR (cardiopulmonary resuscitation).

Prerequisite: Introduction to Fire Science 461033

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Complete the following tasks for I0000 Ropes.
   a. Explain the use of and tie a bowline knot, a clove hitch, figure of eight on the bight, a Becket bend, overhand safety knot, and half-hitch, given the proper size and amount of rope.
   b. Tie an approved knot and hoist any selected forcible entry tool, pike pole/hook, ground ladder, hose line extinguisher, or appliance to a height of at least 12 feet, 3 inches given the proper rope.
   c. Demonstrate the procedure for inspection and maintaining and storing rope.
   d. Use a rope to tie ladders, hose, and other objects to secure them.
   e. Identify the reasons for placing a rope out of service.
   f. Distinguish between life and safety and utility ropes.
2. Complete the following tasks for J0000 Ladders.
   a. Identify the materials used in ladder construction.
   b. Identify and describe the use of the following types of ladders:
      i. Folding/attic,
      ii. Roof,
      iii. Extension,
      iv. Straight/wall, and
      v. Aerial devices.
   c. Carry, position, raise, and lower the following ground ladders:
      i. 14 foot single or wall ladder;
      ii. 24 foot extension ladder;
      iii. 35 foot extension ladder; and
      iv. Folding/attic ladder.
   d. Demonstrate the procedures of working from ground and aerial ladders with tools and appliances, with and without safety harness.
   e. Climb the full length of each type of ground and aerial ladder available; demonstrate carrying firefighting tools or equipment while ascending and descending; demonstrate bringing an injured person down the ladders.
   f. Demonstrate the deployment of a roof ladder on a pitched roof.
3. Complete the following tasks for W0000 Aircraft Rescue.
   a. Explain runway and taxiway designation systems.

b. Explain the four levels of protective clothing used in aircraft firefighting.
c. Describe the various aircraft rescue and firefighting apparatus and equipment.
d. Describe the various specialized extinguishing agents used in aircraft firefighting.
e. List the various aircraft types, engines and systems.
f. Describe the various fuel systems and types of fuel used by aircraft.
g. Explain fuel protection system used on all modern aircraft.
h. Describe the Fire and Rescue Communication Systems used at airports.
i. List and explain the types of aircraft incidents/accidents.
j. List the minimum information needed for responding units in aircraft accidents.
k. List the types of fires that can be expected in aircraft.
l. Describe the unique hazards encountered in fighting aircraft fires.
m. Describe the firefighting tactics required in aircraft incidents.
n. Describe the particular problem encountered with hazardous material on board aircraft.
o. Describe the personal protective equipment used in responding and mitigating aircraft hazardous material incidents.
p. Explain the importance of pre-incident planning for aircraft accidents/incidents.
q. List the factors that should be considered in pre-incident planning for aircraft incidents.
r. Describe the procedures for post-incident operations of aircraft accidents/incidents.
s. List general safety precautions in an airport fire prevention program.
t. Explain why training is important for rescue and firefighting personnel assigned to an airport.
u. Describe the response to military aircraft accidents/incidents.
v. Describe the types of military aircraft in use and the emergency systems of military aircraft.

4. Complete the following tasks for Q0000 Rescue.
   a. Define and demonstrate primary and secondary search procedures under fire condition with and without a rope or hose line.
   b. Don a life safety harness that meets the requirements of NFPA (National Fire Protection Association) 1983, Standard on Fire Service Life Safety Rope, Harness, and Hardware.
   c. Inspect a life safety harness and identify the conditions that would require its removal from service.
   d. Demonstrate the removal of injured persons from an immediate hazard by the use of carries, drags and stretchers.
5. Complete the following tasks for P0021 First Aid.
   a. Demonstrate a primary survey for life threatening injuries.
   b. Identify three types of external bleeding and the characteristics of each type.
   c. Demonstrate three procedures for controlling external bleeding.
   d. Identify characteristics and emergency medical care of thermal burns.
   e. Identify the emergency medical care for chemical burns.
   f. Identify symptoms and care for traumatic shock.
   g. Identify symptoms and care for poisoning and drug overdose.
   h. Identify the method of communication with the poison control center serving local jurisdiction.

i. Identify signs, symptoms and care steps for fractures, dislocations, sprains and strains.
j. Identify the signs, symptoms, and care steps for medical and environmental emergencies included in the National Safety Council and/or American Red Cross courses.

6. Complete the following tasks for P0002 Bloodborne Pathogens.
   a. Discuss the basic science concerning bloodborne pathogens infection and disease.
   b. List the modes of transmission associated with bloodborne pathogens.
   c. Discuss treatment and community resources for infected individuals.
   d. Identify the basic symptoms of bloodborne disease.
   e. Discuss the legal aspects associated with bloodborne pathogens.
   f. Discuss attitudes and behaviors regarding HIV infections and HIV disease (AIDS—Acquired Immunodeficiency Syndrome) processes as they relate to the HIV infected individual on a personal basis, in the workplace associates with potentially or confirmed HIV disease infected patients.
   g. Describe personal protection equipment and procedures.
   h. Identify bio-hazardous waste and waste containers and describe procedure for handling waste.
   i. Describe the procedures for decontaminating exposed surfaces of equipment and environmentals.
   j. Identify the procedures and policies relative to immunization and treatment programs.
   k. List the steps for reporting all exposure incidents.
   l. List the body fluids to which infection controls apply.
   m. List the persons who might be expected to come under the OSHA (Occupational Safety and Health Administration) 1910.1030 standard.
   n. Gain an understanding of the Exposure Control Plan.
   o. List the procedures for compliance with a local Exposure Control Plan.
   p. List and review the practical use of personal protective equipment.
   q. Describe the procedure for attaining vaccinations and participating in follow-up evaluations.
   r. Identify the labels and signs of hazard to employees.
   s. List the training steps required of employers by OSHA (Occupational Safety and Health Administration) 1910.1030.
   t. Identify recordkeeping procedures relative to the standard.
7. Complete the following tasks for X0000 Emergency Disaster Planning.
   a. Demonstrate knowledge of the history of disasters in Kentucky.
   b. Demonstrate an understanding of the law in Kentucky as it relates to disaster planning.
   c. Demonstrate knowledge of the Incident Command System.
   d. Demonstrate knowledge of the responder’s role in an emergency as it relates to Incident Command.
8. Complete the following tasks for G0000 Forcible Entry.
   a. Identify materials and construction features of doors, windows, and walls and the dangers associated with forcing entry through each.
   b. Force entry through at least three different types of doors, windows and walls.
   c. Identify materials and construction features of door and window locking devices.

d. Identify the method and demonstrate procedures of through-the-lock entry for doors and windows.
e. Identify methods and procedures for cleaning, maintaining, and inspecting hand tools used for forcible entry.
f. Identify and safely carry the following: cutting tool, prying tool, pulling tool, striking tool.

9. Complete the following tasks for P0001 CPR (cardiopulmonary resuscitation).
   a. Perform the following procedures relative to cardiopulmonary resuscitation:
      i. Single rescuer for the adult, child, and infant;
      ii. Two rescuer for the adult and child; and
      iii. Management of obstructed airway for the conscious and unconscious adult, child, or infant.
   b. Demonstrate the use of a resuscitation mask in the performance of CPR (cardiopulmonary resuscitation).
   c. Complete certification for CPR (cardiopulmonary resuscitation) and first aid through an accredited organization such as the Red Cross or American Heart Association.

Firefighting Basic Skills II 461034

This course includes Kentucky Fire Commission Training topics R0000 Water Supply, L0000 Foam Streams, N0000 Salvage/Overhaul, S0000 Fire Alarms – Sprinklers, T0001 Hazmat Awareness, and T0002 Hazmat Operations.

Prerequisite: Firefighting Basic Skills I 461032

Recommended Grade Level: 9 – 12

Recommended Credit: 1

Students will:

1. Complete the following tasks for R0000 Water Supply.
   a. Connect a supply hose to a hydrant and fully open and close the hydrant.
   b. Demonstrate hydrant-to-pumper hose connections for forward and reverse hose lays.
   c. Assemble and connect the equipment necessary for drafting from a static water supply source.
   d. Describe the deployment of a portable water tank.
   e. Describe the assembling of equipment necessary for the transfer of water between portable water tanks.
   f. Describe loading and off-loading of tanks on mobile water supply apparatus.
2. Complete the following tasks for L0000 Foam Streams.
   a. Assemble and operate a foam file stream arrangement given the appropriate equipment.
   b. Demonstrate the methods for applying a foam stream.
3. Complete the following tasks for N0000 Salvage/Overhaul.
   a. Identify the purpose of salvage and its value to the public and the fire department.
   b. Demonstrate two folds and rolls for salvage covers.
   c. Demonstrate two methods of deploying salvage covers to cover property.
   d. Demonstrate the construction and use of a water chute.
   e. Demonstrate the construction and use of a water catchall.
   f. Demonstrate the covering or closing of building openings, including doors, windows, floors, and roofs.
   g. Demonstrate the removal of debris and the removal and routing of water from a structure.
   h. Demonstrate the procedures of inspection, cleaning, and maintaining salvage equipment.
   i. Identify the purpose of overhaul.
   j. Recognize at least four indicators of hidden fires.
   k. Expose hidden fires by opening ceilings, walls, and floors and by pulling apart burned materials.
   l. Separate, remove, and relocate charred material to a safe location while protecting the area of origin for determination of cause.
   m. Define duties of Firefighting left at the fire scene for fire and security surveillance.
4. Complete the following tasks for S0000 Fire Alarms – Sprinklers.

a. Explain the procedures for a citizen to report a fire or other emergency.
b. Explain the procedures for receiving a report of a fire or other emergency.
c. Define the purpose and function of all alarm-receiving instruments and personnel-alerting equipment provided to the department and its members.
d. Identify procedures required for receipt and processing of business and personal calls.
e. Define and demonstrate prescribed fire department radio procedures including routine traffic, emergency traffic and emergency evacuation signals.
f. Define the value of automatic sprinklers in providing safety to the occupants of a structure.
g. Identify a fire department sprinkler connection and water motor alarm.
h. Connect hose line(s) to a fire department connection of a sprinkler or standpipe system.
i. Explain how the automatic sprinkler head activates and releases water.
j. Stop the flow of water from a sprinkler head using a wedge or stopper.
k. Identify the main control valve on an automatic sprinkler system.
l. Operate a main control valve on an automatic sprinkler system from “open” to “closed” and then back to “open”.

5. Complete the following tasks for T0001 Hazmat Awareness.
   a. Identify the definition of hazardous materials.
   b. Identify the DOT hazard classes and divisions of hazardous materials.
   c. Identify common examples of materials in each hazard class or division.
   d. Identify the primary hazards associated with each of the DOT hazard classes and divisions of hazardous materials by class or division.
   e. Identify typical container shapes that may indicate hazardous materials.
   f. Identify typical occupancies and locations in the community where hazardous materials are manufactured, transported, stored, used, or disposed of.
   g. Identify facility and transportation marking and colors that indicate hazardous materials, including UN/NA (United National/North American) identification numbers, NFPA (National Fire Protection Association) 704 markings, military hazardous materials markings, special hazard communication markings, pipeline marker, and container markings.
   h. Given an NFPA (National Fire Protection Association) 704 marking, identify the significance of the colors, numbers, and special symbols.
   i. Identify U.S. and Canadian placards and labels that indicate hazardous materials.
   j. Identify the basic information on material safety data sheets (MSDS) and shipping papers that indicate hazardous materials.
   k. Identify where to find materials safety data sheets (MSDS).
   l. Identify entries on a material safety data sheet (MSDS) that indicate the presence of hazardous materials.
   m. Identify the entries on shipping papers that indicate the presence of hazardous materials.
   n. Match the name of the shipping papers found in transportation (air, highway, rail, and water) with the mode of transportation.
   o. Identify the person responsible for having the shipping papers in each mode of transportation.
   p. Identify where the shipping papers are found in each mode of transportation.

q. Identify where the papers may be found in an emergency in each mode of transportation.
r. Identify examples of clues (other than occupancy/location, container shape, marking/color, placard/labels and shipping papers) that use the senses of sight, sound, and odor to indicate hazardous materials.
s. Describe the limitation of using the senses in determining the presence or absence of hazardous materials.
t. Identify difficulties encountered in determining the specific names of hazardous materials in both facilities and transportation.
u. Identify sources for obtaining the names of, UN/NA (United National/North American) identification numbers for, or types of placard associated with hazardous materials in transportation.
v. Identify sources for obtaining the names of hazardous materials in a facility.
w. Identify the ways hazardous materials are harmful to people, the environment, and property at hazardous materials incidents.
x. Identify the general routes of entry for human exposure to hazardous materials.
y. Given the current edition of the Emergency Response Guidebook, identify the three methods of determining the appropriate guide paper for a specific hazardous material.
z. Given the current edition of the Emergency Response Guidebook, identify the two general types of hazards found in each guide page.
aa. Identify the location of both the local emergency response plan and the organization's standard operating procedures.
bb. Given a copy of the current edition of the Emergency Response Guidebook, describe the difference between the protective action distances in the orange-bordered guide pages and the green-bordered guide pages in the document.
cc. Given the local emergency response plan or the organization's standard operating procedures, identify the role of the first responder at the awareness level during a hazardous materials incident.
dd. Given the local emergency response plan or the organization's standard operating procedures, identify the basic precautions to be taken to protect himself/herself and others in a hazardous materials incident.
ee. Identify the precautions necessary when providing emergency medical care to victims of hazardous materials incidents.
ff. Identify typical ignition sources found at scenes of hazardous materials incidents.
gg. Given the identity of various hazardous materials, (name, UN/NA [United National/North American] identification number, or type placard), identify the following response information using the current edition of the Emergency Response Guidebook:
    i. Emergency action (fire, spill, or leak and first aid);
    ii. Personal protective equipment necessary; and
    iii. Initial isolation and protective action distances.
hh. Given the current edition of the Emergency Response Guidebook and the name of a hazardous material, identify the recommended personal protective equipment for the particular incident from the following list of protective equipment.
    i. Street clothing and work uniforms;
    ii. Structure Firefighting protective clothing;

iii. Positive pressure self-contained breathing apparatus;
iv. Chemical-protective clothing and equipment.

ii. Given the correction edition of the Emergency Response Guidebook, identify the definitions for each of the following protective actions:
i. Isolate hazard area and deny entry;
ii. Evacuate; and
iii. In-place protections.

jj. Given the current edition of the Emergency Response Guidebook, identify the shapes of recommended initial isolation and protective action zones.

kk. Given the current edition of the Emergency Response Guidebook, describe the differences between small and large spills as found in the table of isolation distances.

ll. Given the current edition of the Emergency Response Guidebook, identify the circumstances under which the following distances are used at a hazardous materials incident:
i. Table of initial isolation and protective action distances; and
ii. Isolation distances in the numbered guides.

mm. Identify the techniques used to isolate the hazard area and deny entry to unauthorized persons at hazardous materials incidents.

nn. Identify the initial notification procedures for hazardous materials incidents in the local emergency response plan or the organization's standard operating procedures.

6. Complete the following tasks for T0002 Hazmat Operations.
a. Given the examples of various hazardous materials containers, identify the general shapes of containers for liquids, gases, and solids.
b. Given examples of the following tank cars, identify each tank car by type.
i. Non-pressure tank cars with and without expansion domes;
ii. Pressure tank cars; and
iii. Cryogenic liquid tank cars.
c. Given examples of the following intermodal tank containers, identify each intermodal tank container by type.
i. Non-pressure intermodal tank containers; and
ii. Pressure intermodal tank containers.
d. Given examples of the following cargo tanks, identify each cargo tank by type.
i. MC-306/DOT-406 cargo tanks;
ii. MC-307/DOT-407 cargo tanks;
iii. MC-312/DOT-412 cargo tanks;
iv. MC-331 cargo tanks;
v. MC-338 cargo tanks; and
vi. Dry bulk cargo tanks.
e. Identify each fixed facility tank by type: non-pressure facility tanks and pressure facility tanks.
f. Given examples of facility and transportation containers, identify the markings that differentiate one container from another.
g. Given examples of the following transport vehicles and their corresponding shipping papers, identify the vehicle or tank identification markings in all applicable locations.
i. Rail transport vehicles, including tank cars;
ii. Intermodal equipment including tank containers; and

iii. Highway transport vehicles, including cargo tanks.

h. Given examples of facility containers, identify the markings indicating container sizes, products contained, and/or site identification numbers.
i. Given examples of facility and transportation situations involving hazardous materials, identify the names of the hazardous materials in each situation.
j. Identify the following information on a pipeline marker: product, owner, and emergency telephone number.
k. Given a pesticide label, identify each of the following pieces of information; then match the piece of information to its significance in surveying the hazardous materials incident.
    i. Name of pesticide
    ii. Signal word
    iii. Pest control product (PCP) number (in Canada)
    iv. Precautionary statement
    v. Hazard statement; and
    vi. Active ingredient.
l. Identify and list the surrounding conditions that should be noted when surveying hazardous materials incidents.
m. Give examples of ways to verify information obtained from the survey or a hazardous materials incident.
n. Match the definitions associated with the DOT hazard classes and divisions of hazardous materials, include refrigerated liquefied gases and cryogenic liquids, with the class or division.
o. Identify two ways to obtain a material safety data sheet (MSDS) in an emergency.
p. Using a material safety data sheet (MSDS) for a specified material, identify the following hazard and response information:
    i. Physical and chemical characteristics
    ii. Physical and hazards of the material
    iii. Health hazards of the material
    iv. Signs and symptoms of exposure
    v. Route of entry
    vi. Permissible exposure limits
    vii. Responsible party contact
    viii. Precautions for safe handling (including hygiene practices, protective measures, procedures for cleanup of spills or leaks)
    ix. Applicable control measures including personal protective equipment, and
    x. Emergency and first aid procedures.
q. Identify the type of assistance provided by, how to contact, and the information to be furnished to CHEMTREC/CANUTEC (Chemical Transportation Emergency Center/Canadian Transport Emergency Center).
r. Identify two methods of contacting the manufacturer or shipper to obtain hazard and response information.
s. Given situations involving known hazardous materials, interpret the hazard and response information obtained for the current edition of the Emergency Response Guidebook, materials safety data sheets (MSDS), CHEMTREC/CANUTEC

(Chemical Transportation Emergency Center/Canadian Transport Emergency Center), and shipper/manufacturer contacts.

t. Match the following chemical and physical properties with their significance and impact on the behavior of the container and/or its contents.
   i. Corrosivity (pH)
   ii. Flammable (explosive) range
   iii. Flash point
   iv. Form (solid, liquid, gas)
   v. Ignition (auto ignition) temperature
   vi. Reactivity
   vii. Specific gravity
   viii. Toxic products of combustion
   ix. Vapor density, and
   x. Water solubility.

u. Identify the differences among the following terms:
   i. Exposure and hazard
   ii. Exposure and contamination, and
   iii. Contamination and secondary contamination.

v. Identify three types of stress that could cause a container system to release its contents.

w. Identify five ways in which containers can breach.

x. Identify four ways in which containers can release their contents.

y. Identify at least four dispersion patterns that can be created upon release of a hazardous material.

z. Identify the three general time frames for predicting the length of time that exposures may be in contact with hazardous materials in an endangered area.

aa. Identify the health and physical hazards that could cause harm.

bb. Identify the health hazards associated with the following terms: asphyxiant, irritant/corrosive, sensitizer/allergen, convulsant, and chronic health hazard.

cc. Identify a resource for determining the size of an endangered area of a hazardous materials incident.

dd. Given the dimensions of the endangered area and the surrounding conditions at a hazardous materials incident, estimate the number and type of exposures within that endangered area.

ee. Identify resources available for determining the concentrations of a released hazardous material within an endangered area.

ff. Identify the factors for determining the extent of physical, health, and safety hazards within the endangered area of a hazardous materials incident given the concentrations of the released materials.

gg. Identify the steps for determining the number of exposures that could be saved by the first responders with the resources provided by the authority having jurisdiction and operating in a defensive fashion, given an analysis of hazardous materials problems and the exposures already lost.

hh. Describe the steps for determining defensive response objectives, given analysis of a hazardous material incident.

ii. Identify the defensive operations to accomplish a given response objective.

jj. Identify the purpose for, and the procedures, equipment, and safety precautions used with each of the following control techniques.
    i. Absorption
    ii. Dike, dam, diversion, retention
    iii. Dilution
    iv. Vapor dispersion, and
    v. Vapor suppression.
kk. Identify the appropriate respiratory protection required for a given defensive option.
ll. Identify the three types of respiratory protection and the advantages and limitations presented by the use of each at hazardous materials incidents.
mm. Identify the required physical capabilities and limitations of personnel working in positive pressures self-contained breathing apparatus.
nn. Identify the appropriate personal projective equipment required for a given defensive option.
oo. Identify skin contact hazards encountered at hazardous materials incidents.
pp. Identify the purpose, advantages and limitations of the following levels of protecting clothing at hazardous materials incidents.
    i. Structural firefighting clothing
    ii. High temperature protective clothing, and
    iii. Chemical protective clothing (liquid splash protective and vapor protective clothing).
qq. Identify ways that personnel, personal protective equipment, apparatus, and equipment become contaminated.
rr. Describe how the potential for secondary contamination determines the need for emergency decontamination procedures.
ss. Identify the purpose of emergency decontamination procedures at hazardous materials incidents.
tt. Identify the advantages and limitations of emergency decontamination procedures.
uu. Identify the procedures for establishing scene control through control zones.
vv. Identify the criteria for determining the location of the control zones at hazardous materials incidents.
ww. Identify the basic techniques for evacuation and in-place protection.
xx. Identify the considerations associated with locating emergency decontamination areas.
yy. Demonstrate the ability to perform emergency decontamination.
zz. Identify the items to be considered in a safety briefing prior to allowing personnel to work on a hazardous materials incident.
aaa. Identify the role of the first responder at the operations level during hazardous materials incidents as specified in the local emergency response plan and the organizations standard operating procedures.
bbb. Identify the levels of hazardous materials incidents as defined in the local emergency response plan.
ccc. Identify the purpose, need, benefits and elements of an incident.
ddd. Identify the considerations for determining the location of the command post for a hazardous materials incident.

eee. Identify the procedures for requesting additional resources at a hazardous materials incident.

fff. Identify the responsibility of the safety officer.

ggg. Identify the importance of the buddy system in implementing the planned defensive options.

hhh. Identify the importance of the back-up personnel in implementing the planned defensive options.

iii. Identify the safety precaution to be observed when approaching and working at hazardous materials incidents.

jjj. Identify the symptoms of heat and cold stress.

kkk. Identify the physical capabilities required for and the limitations of personnel working in the personal protective equipment as provided by the authority having jurisdiction.

lll. Match the function of the operational components of the positive pressure self-contained breathing apparatus provided the hazardous materials responder to the name of the component.

mmm. Describe the appropriate tools and equipment, and describe how to perform the following defensive control activities.

  i. Absorption
  ii. Dike, dam, diversion and retention
  iii. Dilution
  iv. Vapor dispersion, and
  v. Vapor suppression

nnn. Identify the location and use of the mechanical, hydraulic and air emergency remote shutoff devices as found on MC-306/DOT-406 and MC-331 cargo tanks.

ooo. Describe the objective and dangers of search and rescue missions at hazardous materials incidents.

ppp. Identify the considerations for evaluation as to whether defensive options are effective in accomplishing the objectives.

qqq. Describe the circumstances under which it would be prudent to pull back from a hazardous materials incident.

rrr. Identify the methods for communicating the status of the planned response to the incident commander through the normal chain of command.

sss. Identify the methods for immediate notification of the incident commander and other response personnel about critical emergency conditions at the incident.

Firefighting Basic Skills III 461031

This course includes Kentucky Fire Commission Training topics V0000 Building Construction, FC30000 KY Wildland Fire Awareness, M0000 Fire Control, H0000 Ventilation, Y0000 Fire Investigation, C0000 Communications, U0000 Fire Prevention, O0000 Victim Search/Rescue, Q0001 Vehicle Rescue, FC10000 KY FF Survival, and FC20000 KY FF Rescue.

Prerequisites: Firefighting Basic Skills I 461032 **AND** Firefighting Basic Skills II 461034

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Complete the following tasks for V0000 Building Construction.
   a. Describe the basic structural characteristics of the following types of building construction: wood frame, ordinary, heavy timber, non-combustible, fire resistant.
   b. Identify the general fire behavior expected with each type of building construction, including the spread of fire and the safety of the building, occupants, and Firefighting.
   c. Describe at least three hazards associated with truss and lightweight construction.
   d. Identify dangerous building conditions created by fire and fire suppression activities.
   e. Identify five indicators of building collapse.
   f. Describe the effects of fire and fire suppression activities on the following building materials: wood, masonry (brick, block, and stone), cast iron, steel, reinforced concrete, gypsum wall board, glass, and plaster on lath.
   g. Define the following terms as they related to building construction: veneer wall (exterior), party wall, fire wall, partition wall, cantilever or unsupported wall, load bearing.
2. Complete the following tasks for FC30000 KY Wildland Fire Awareness.
   a. Describe the fire triangle.
   b. Identify three methods of heat transfer.
   c. List the three principle environmental elements affecting wildland fire behaviors.
   d. List three factors of fuel that affect the start and spread of wildland fires.
   e. List three factors of weather that affect fuel moisture.
   f. Describe how wind affects wildland fire spread.
   g. Describe how the slope affects wildland fire spread.
   h. List four factors of topography that affect wildland fire behavior.
   i. Describe the dangerous conditions that can develop in a box canyon and steep narrow canyons.
   j. List indicators of an approaching cold front and describe what wind changes to expect.
   k. List three common foehn wind conditions and the areas in which they occur.
   l. Identify a thunderstorm and describe how and when it is dangerous.
   m. Describe the daily cycle of slope and valley winds.
   n. Describe the effect relative humidity has on wildland fire behavior.

   o. Identify the wildland fire environment indicators that can produce problems and extreme fire behavior.
3. Complete the following tasks for M0000 Fire Control.
   a. Discuss or simulate the following live fires working as a member of a team and using appropriate protective equipment, firefighting tools, and extinguishing agents (Working with actual live fires is not applicable for high school students).
      i. Piles/stacks of Class A combustible materials (exterior);
      ii. Open pans of combustible liquids (exterior);
      iii. Vehicle fires;
      iv. Storage containers (exterior dumpster/trash bin); and
      v. Class "A" combustible materials within a structure (interior attack).
   b. Explain the procedures for extinguishing ground cover fires.
4. Complete the following tasks for H0000 Ventilation.
   a. Define the principles of ventilation and identify the advantages and effects of proper ventilation.
   b. Identify the safety considerations and precautions to be taken while ventilating a structure.
   c. Identify the signs, causes, and effects of backdraft explosion.
   d. Identify methods of preventing a backdraft explosion.
   e. Describe the advantages and disadvantages of the following types of ventilation: vertical, horizontal, trench/strip, mechanical, mechanical pressurization, and hydraulic.
   f. Define procedures for each type of ventilation.
   g. Identify the types of tools used during ventilation.
   h. Determine the integrity of a roof system by sounding.
   i. Open various types of windows from inside and outside, with and without the use of tools.
   j. Demonstrate breaking window or door glass and removing obstructions.
   k. Using both hand and power tools, demonstrate the ventilation of both pitched and flat roofs.
   l. Recognize the characteristics of and list necessary precautions when ventilating at least the following roof types: flat, shed, pitched, and arched.
   m. Describe how the following factors are used to determine the integrity of a roof system: construction, visual observation, and elapsed time of fire.
5. Complete the following tasks for Y0000 Fire Investigation.
   a. Identify the responsibility of a fire investigator.
   b. Conduct a simulated investigation and collect statements at the scene.
   c. Take the proper steps to secure a scene.
   d. Identify legal considerations in fire investigations.
   e. Protect and preserve all evidence.
   f. Assess the cause and origins of fires.
6. Complete the following tasks for C0000 Communications.
   a. Explain the procedures for a citizen to report a fire or other emergency.
   b. Explain the procedures for receiving a report of a fire or other emergency.
   c. Define the purpose and function of all alarm-receiving instruments and personnel-alerting equipment provided to the department and its members.

   d. Identify procedures required for receipt and processing of business and personal calls.
   e. Define and demonstrate prescribed fire department radio procedures including routine traffic, emergency traffic and emergency evacuation signals.
7. Complete the following tasks for U0000 Fire Prevention.
   a. Identify the steps used in conducting fire safety surveys.
   b. Identify types of fuel hazards and heat source hazards.
   c. Distinguish among common fire hazards, special fire hazards, personal hazards, and target hazards.
   d. Review the guidelines for conducting a residential fire safety survey.
   e. Train others in injury prevention through fire and life safety education.
8. Complete the following tasks for O0000 Victim Search/Rescue.
   a. Identify situational awareness consideration for a structural search.
   b. Determine safety considerations during a structural search.
   c. Perform a basic victim search and removal methods in a rescue situation.
   d. Identify procedures for conducting primary/secondary searches.
   e. Demonstrate using various drags, lifts, and carries for victims.
9. Complete the following tasks for Q0001 Vehicle Rescue.
   a. Identify and demonstrate the methods for removing vehicle glass.
   b. Identify vehicle roof posts with the appropriate letter designation.
   c. Demonstrate the removal of vehicle doors and roofs.
10. Complete the following tasks for FC10000 KY FF Survival.
   a. Review conditions and situations which may pose a risk to Firefighting.
   b. Determine procedures for helping fellow firefighters in emergency situations.
   c. Describe situations that lead to entrapment/disorientation.
   d. Show different techniques a firefighter can use when the primary escape route becomes blocked or if caught in a rapidly deteriorating situation.
   e. Demonstrate self-rescue techniques and emphasize self-rescue tools regularly carried by or available to the firefighter.
11. Complete the following tasks for FC20000 KY FF Rescue.
   a. Practice effective communications that may be needed in an emergency situation including delivery of and response to mayday calls.
   b. Determine the makeup and responsibilities of rapid intervention teams.
   c. Discuss how to set up a rapid intervention team in their own department.
   d. Practice fire ground safety.
   e. Demonstrate techniques necessary to accomplish self-rescue.
   f. Concentrate on safely removing a trapped or unconscious firefighter from a burning structure, which can be a labor intensive operation.
   g. Show methods that can be used to remove firefighters who have become victims themselves.
   h. Review OSHA (Occupational Safety and Health Administration) requirements for “2 in and 2 out”.

Firefighting Intermediate Skills I 461036

This course includes Kentucky Fire Commission Training Topics Z0000 Pumper Operations, CC0000 Drivers Training, A0000 Administration and Organization, FC40000 KY Flashover, F0000 Personal Protective Equipment II, K0000 Fire Hose, and D0000 Fire Behavior.

Prerequisite: Firefighting Basic Skills III 461031 **AND** a valid driver's license

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Complete the following tasks for Z0000 Pumper Operations.
   a. Identify the operating principles of single-state and multiple-stage centrifugal fire pumps.
   b. Given pump models or diagrams, identify the major components and trace the flow of water through single-state and multiple-state centrifugal pumps.
   c. Identify the percentages of rated capacity, rated pressures, and the capacity in gallons per minute (GPM) at the rated pressures a fire department pumper is designed to deliver.
   d. Given a fire department pumper and the necessary equipment, demonstrate and annual pumper service test.
   e. Identify the following conditions that may result in possible pumper apparatus damage or unsafe operations: cavitation; leaking fuel, oil, or water; overheating; unusual noises; vibrations; and water hammer.
   f. Identify corrective measures for cavitation; leaking fuel, oil or water; overheating; unusual noises; vibrations; and water hammer.
   g. Identify incrustation, tuberculation, and sedimentation, and their effects on the carrying capacities of water mains.
   h. Identify and describe various types of hydrants:
      i. Connection size and type of thread of discharge openings;
      ii. Construction and operations of drain valve;
      iii. Direction of operation of the main valve;
      iv. Internal diameter of hydrant barrel;
      v. Hydrant discharge outlet coefficient; and
      vi. Procedures and policies of hydrant locations.
   i. Identify the available fire flows in various areas.
   j. Identify problems related to flow from dead-end water mains.
   k. Given reference materials, identify and explain the approximate pressure-discharge relationship for various water pipe sizes.
2. Complete the following tasks for CC0000 Drivers Training.
   a. Perform routine tests, inspections, and servicing functions required to assure the operations status of fire department vehicles including battery check, braking system, coolant system, electrical system, fueling, hydraulic fluids, lubrications, oil levels, tire care, steering systems, and tools, appliances, and equipment.

b. Demonstrate the recording and reporting, as specified by the authority having jurisdiction, of all servicing functions.
c. Identify all applicable state and local laws of the authority having jurisdiction, including rules and regulations governing the safe driving and operation of fire department vehicles.
d. Given a fire department vehicle, identify all automotive gauges and demonstrate their usage.
e. Review driving skills needed for certification.
f. Identify and demonstrate the theory and principles of defensive driving techniques, both emergency and non-emergency.
g. Identify all applicable state and local laws, including rules and regulations governing the safe driving and operation of all fire department vehicles of the authority having jurisdiction, on emergency response.
h. Demonstrate legal and safe driving, positioning, and operating of assigned fire department vehicles of the authority having jurisdiction in emergency response conditions.
i. Describe the safety precautions necessary when driving during adverse environmental conditions.
j. Describe the effects of braking reaction time, load control factors, and general steering reactions on vehicle control.
k. Perform routine tests, inspections and servicing functions required to assure the operational statue of fire department pumpers, including battery check, booster tank level (if applicable), braking system, coolant system, electrical system, hydraulic fluids, fueling, lubrication, oil levels, pumping system, steering systems, tire care, and tools, appliances, and equipment.

3. Complete the following tasks for A0000 Administration and Organization.
   a. Describe the organization of the fire department.
   b. Explain the Firefighter I's role as a member of the organization.
   c. Explain the mission of the first service and of the local fire department.
   d. Explain the function of Standard Operating Procedures.
   e. Explain fire department rules and regulations that apply to the position of Firefighting.
   f. Explain the components of and the firefighter's role within the local incident management system.
   g. Explain the role of other agencies that may respond to emergencies.
   h. Describe the components of a member assistance program.
4. Complete the following tasks for FC40000 KY Flashover.
   a. Recognize the signs of an impending flashover.
   b. Identify and practice techniques for escaping a flashover.
5. Complete the following tasks for F0000 Personal Protective Equipment.
   a. Identify the function of the following articles of protective equipment.
      i. Helmet with eye shield
      ii. Hood
      iii. Boots
      iv. Gloves
      v. Protective trousers

vi. Protective coat
vii. Self-Contained Breathing Apparatus (SCBA)
viii. Personal Alert Safety System (PASS), and
ix. Eye protection.

b. Identify and demonstrate the care, use, inspection, maintenance, and limitations of the protective clothing and equipment.
c. Demonstrate the donning of protective equipment.
d. Identify hazardous environments that require respiratory protection.
e. Identify the physical requirements of Self-Contained Breathing Apparatus (SCBA) wearer.
f. Describe the uses and limitations of Self-Contained Breathing Apparatus (SCBA).
g. Identify each component and safety feature of Self-Contained Breathing Apparatus (SCBA).
h. Describe the function of each component of Self-Contained Breathing Apparatus (SCBA).
i. Assure that Self-Contained Breathing Apparatus (SCBA) is in a safe condition for immediate use.
j. Demonstrate the use of Self-Contained Breathing Apparatus (SCBA) under the conditions of obscured visibility and restricted passage.
k. Demonstrate the procedures for Self-Contained Breathing Apparatus (SCBA) use: emergency by-pass valve, conservation of air, regulator breathing, maximum use of air under working conditions, and cylinder replacements.
l. Demonstrate and document routine maintenance for Self-Contained Breathing Apparatus (SCBA), including inspection, cleaning, sanitizing and cylinder recharging.
m. Demonstrate rescue procedures for the following:
    i. A firefighter with functioning respiratory protection;
    ii. A firefighter without functioning respiratory protection; and
    iii. A civilian without respiratory protection.

6. Complete the following tasks for K0000 Hose, Nozzles, and Appliances.
    a. Describe the application of each size and type of hose on a pumper as required to be carried by NFPA (National Fire Protection Association) 1901.
    b. Demonstrate the use of nozzles, adapters and hose appliances and tools on a pumper as required by NFPA (National Fire Protection Association) 1901.
    c. Advance uncharged and charged attack lines of two different sizes of 1 ½ inch or larger, from a pumper, for the following evolutions:
        i. Into a structure
        ii. Up a ladder to a second floor landing
        iii. Up an inside stairway to an upper floor
        iv. Up an outside stairway to an upper floor
        v. Down an inside stairway to a lower floor
        vi. Down an outside stairway to a lower floor, and
        vii. To an upper floor by hoisting.
    d. Demonstrate the following given fire hose used for fire attack and water supply:
        i. Three types of hose loads and finishes
        ii. Three types of hose rolls

iii. Coupling and uncoupling two lengths
iv. Two hose carries extending hose lines, and
v. Replacing burst sections of hose.

e. Demonstrate operations of a charged attack line 1 ½ inch or larger from the ground ladder.
f. Demonstrate carrying a 100-foot attack line 1 ½ inch or larger into a building, connecting it to a standpipe, and advancing the line from the standpipe.
g. Demonstrate a hand lay of 300 feet of supply line 2 ½ inch or larger from a pumper to a water source.
h. Define a fire stream.
i. Define water hammer and at least one method of its prevention.
j. Demonstrate how to open and close a nozzle and how to adjust its stream pattern and flow setting, when applicable.
k. Identify the type, design, operation, required nozzle pressure, and flow of a given selection of nozzles and tips.
l. Define the following methods of water application: direct, indirect, combination.
m. Identify precautions to be followed while advancing hose lines to a fire.
n. Identify three observable results that are obtained when the proper application of a fire stream is accomplished.

7. Complete the following tasks for D0000 Fire Behavior.
   a. Define fire.
   b. Define fire triangle and tetrahedron.
   c. Recognize the various conditions related to three (3) stages and three (3) conditions of fire and their associated hazards.
   d. Identify three products of combustion found in structural fires that create life hazards.
   e. Define the three methods of heat transfer.
   f. Define the three physical states of matter in which fuels are commonly found.
   g. Define the relationship of the concentrations of oxygen to combustibility and life safety.
   h. Describe the process of thermal layering that occurs in structural fires and how to avoid disturbing the normal layering of heat.

Firefighting Intermediate Skills II 461066

This course includes Kentucky Fire Commission Training topics D0000 Fire Behavior, K0000 Fire Hose, I0000 Ropes, G0000 Forcible Entry, and F0000 Personal Protective Equipment. Students will complete the NIMS (National Incident Management System) 100, 200, 300 and 700 certifications during this course.

Prerequisite: Firefighters Intermediate Skills I 461036

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Complete the following tasks for D0000 Fire Behavior.
   a. Define fire.
   b. Define fire triangle and tetrahedron.
   c. Recognize the various conditions related to three (3) stages and three (3) conditions of fire and their associated hazards.
   d. Identify three products of combustion found in structural fires that create life hazards.
   e. Define the three methods of heat transfer.
   f. Define the three physical states of matter in which fuels are commonly found.
   g. Define the relationship of the concentrations of oxygen to combustibility and life safety.
   h. Describe the process of thermal layering that occurs in structural fires and how to avoid disturbing the normal layering of heat.
2. Complete the following tasks for K0000 Hose, Nozzles, and Appliances.
   a. Describe the application of each size and type of hose on a pumper as required to be carried by NFPA (National Fire Protection Association) 1901.
   b. Demonstrate the use of nozzles, adapters and hose appliances and tools on a pumper as required by NFPA (National Fire Protection Association) 1901.
   c. Advance uncharged and charged attack lines of two different sizes of 1 ½ inch or larger, from a pumper, for the following evolutions:
      i. Into a structure
      ii. Up a ladder to a second floor landing
      iii. Up an inside stairway to an upper floor
      iv. Up an outside stairway to an upper floor
      v. Down an inside stairway to a lower floor
      vi. Down an outside stairway to a lower floor and
      vii. To an upper floor by hoisting.
   d. Demonstrate the following given fire hose used for fire attack and water supply:
      i. Three types of hose loads and finishes
      ii. Three types of hose rolls
      iii. Coupling and uncoupling two lengths
      iv. Two hose carries extending hose lines, and
      v. Replacing burst sections of hose.

e. Demonstrate operations of a charged attack line 1 ½ inch or larger from the ground ladder.
f. Demonstrate carrying a 100-foot attack line 1 ½ inch or larger into a building, connecting it to a standpipe, and advancing the line from the standpipe.
g. Demonstrate a hand lay of 300 feet of supply line, 2 ½ inch or larger, from a pumper to a water source.
h. Define a fire stream.
i. Define water hammer and at least one method of its prevention.
j. Demonstrate how to open and close a nozzle and how to adjust its stream pattern and flow setting, when applicable.
k. Identify the type, design, operation, required nozzle pressure, and flow of a given selection of nozzles and tips.
l. Define the following methods of water application: direct, indirect, combination.
m. Identify precautions to be followed while advancing hose lines to a fire.
n. Identify three observable results that are obtained when the proper application of a fire stream is accomplished.

3. Complete the following tasks for I0000 Ropes.
   a. Explain the use of and tie a bowline knot, a clove hitch, figure of eight on the bight, a Becket bend, overhand safety knot, and half-hitch, given the proper size and amount of rope.
   b. Tie an approved knot and hoist any selected forcible entry tool, pike pole/hook, ground ladder, hose line extinguisher, or appliance to a height of at least 12 feet, 3 inches given the proper rope.
   c. Demonstrate the procedures of inspection, maintaining and storing rope.
   d. Use a rope to tie ladders, hose, and other objects to secure them.
   e. Identify the reasons for placing a rope out of service.
   f. Distinguish between life and safety and utility ropes.
4. Complete the following tasks for G0000 Forcible Entry:
   a. Identify material and construction features of doors, windows, and walls and the dangers associated with forcing entry through each.
   b. Force entry through at least three different types of doors, windows, and walls.
   c. Identify materials and construction features of door and window locking devices.
   d. Identify the method and demonstrate procedures of through-the-lock entry for doors and windows.
   e. Identify methods and procedures for cleaning, maintaining, and inspecting hand tools used for forcible entry.
   f. Identify and safely carry at least one of the following: cutting tool, prying tool, pulling tool, striking tool.
5. Complete the following tasks for F0000 Personal Protective Equipment.
   a. Identify the function of the following articles of protective equipment:
      i. Helmet with eye shield
      ii. Hood
      iii. Boots
      iv. Gloves
      v. Protective trousers
      vi. Protective coats

vii. Self-Contained Breathing Apparatus (SCBA)
viii. Personal Alert Safety System (PASS), and
ix. Eye protection.

b. Identify and demonstrate the care, use, inspection, maintenance, and limitations of the protective clothing and equipment.
c. Demonstrate the donning of protective equipment.
d. Identify hazardous environments that require respiratory protection.
e. Identify the physical requirements of Self-Contained Breathing Apparatus (SCBA) wearer.
f. Describe the uses and limitations of Self-Contained Breathing Apparatus (SCBA).
g. Identify each component and safety feature of Self-Contained Breathing Apparatus (SCBA).
h. Describe the function of each component of Self-Contained Breathing Apparatus (SCBA).
i. Assure that Self-Contained Breathing Apparatus (SCBA) is in a safe condition for immediate use.
j. Demonstrate the use of Self-Contained Breathing Apparatus (SCBA) under the conditions of obscured visibility and restricted passage.
k. Demonstrate the procedures for Self-Contained Breathing Apparatus (SCBA) use: emergency by-pass valve, conservation of air, regulator breathing, maximum use of air under working conditions, and cylinder replacements.
l. Demonstrate and document routine maintenance for Self-Contained Breathing Apparatus (SCBA), including inspection, cleaning, sanitizing and cylinder recharging.
m. Demonstrate rescue procedures for the following:
    i. A firefighter with functioning respiratory protection;
    ii. A firefighter without functioning respiratory protection; and
    iii. A civilian without respiratory protection.

6. Participate in the NIMS (National Incident Management System) 100, 200, 300, and 700 exams.

Firefighting Intermediate Skills III 461067

This course provides further expansion of Firefighter Basic Skills III and includes Kentucky Fire Commission Training topics V0000 Building Construction, M0000 Fire Control, H0000 Ventilation, Y0000 Fire Investigation, C0000 Communications, U0000 Fire Prevention, O0000 Victim Search/Rescue, Q0001 Vehicle Rescue, FC10000 KY FF Survival, and FC20000 KY FF Rescue.

Prerequisite: Firefighting Intermediate Skills II 461066

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Complete the following tasks for V0000 Building Construction.
   a. Describe the basic structural characteristics of the following types of building construction: wood frame, ordinary, heavy timber, non-combustible, fire resistant.
   b. Identify the general fire behavior expected with each type of building construction, including the spread of fire and the safety of the building, occupants, and firefighter.
   c. Describe at least three hazards associated with truss and lightweight construction.
   d. Identify dangerous building conditions created by fire and fire suppression activities.
   e. Identify five indicators of building collapse.
   f. Describe the effects of fire and fire suppression activities on the following building materials: wood, masonry (brick, block, and stone), cast iron, steel, reinforced concrete, gypsum wall board, glass, and plaster on lath.
   g. Define the following terms as they relate to building construction: veneer wall (exterior), party wall, fire wall, partition wall, cantilever or unsupported wall, load bearing.
2. Complete the following tasks for M0000 Fire Control.
   a. Discuss or simulate the following live fires working as a member of a team and using appropriate protective equipment, firefighting tools, and extinguishing agents (Working with actual live fires is not applicable for high school students):
      i. Piles/stacks of Class A combustible materials (exterior);
      ii. Open pans of combustible liquids (exterior);
      iii. Vehicle fires;
      iv. Storage containers (exterior dumpsters/trash bins); and
      v. Class “A” combustible materials within a structure (interior attack).
   b. Explain the procedures for extinguishing ground cover fires.
3. Complete the following tasks for H0000 Ventilation.
   a. Define the principles of ventilation and identify the advantages and effects of proper ventilation.
   b. Identify the safety considerations and precautions to be taken while ventilating a structure.
   c. Identify the signs, causes, and effects of a backdraft explosion.
   d. Identify methods of preventing a backdraft explosion.

   e. Describe the advantages and disadvantages of the following types of ventilation: vertical, horizontal, trench/strip, mechanical, mechanical pressurization, and hydraulic.
   f. Define procedures for each type of ventilation.
   g. Identify the types of tools used during ventilation.
   h. Determine the integrity of a roof system by sounding.
   i. Open various types of windows from inside and outside, with and without the use of tools.
   j. Demonstrate breaking window and door glass and removing obstructions.
   k. Using both hand and power tools, demonstrate the ventilation of both pitched and flat roofs.
   l. Recognize the characteristics of and list necessary precautions when ventilating at least the following roof types: flat, shed, pitched, and arched.
   m. Describe how the following factors are used to determine the integrity of a roof system: construction, visual observation, and elapsed time of fire.
4. Complete the following tasks for Y0000 Fire Investigation.
   a. Identify the responsibility of a fire investigator.
   b. Conduct a simulated investigation and collect statements at the scene.
   c. Take the proper steps to secure a scene.
   d. Identify legal considerations in fire investigations.
   e. Protect and preserve all evidence.
   f. Assess the causes and origins of fires.
5. Complete the following tasks for C0000 Communications.
   a. Explain the procedures for a citizen to report a fire or other emergency.
   b. Explain the procedures for receiving a report of a fire or other emergency.
   c. Define the purpose and function of all alarm-receiving instruments and personnel-alerting equipment provided to the department and its members.
   d. Identify procedures required for receipt and processing of business and personal calls.
6. Define and demonstrate prescribed fire department radio procedures including routine traffic, emergency traffic, and emergency evacuation signals.
7. Complete the following tasks for U0000 Fire Prevention.
   a. Identify the steps used in conducting fire safety surveys.
   b. Identify types of fuel hazards and heat source hazards.
   c. Distinguish among common fire hazards, special fire hazards, personal hazards, and target hazards.
   d. Review the guidelines for conducting a residential fire safety survey.
   e. Train others in injury prevention through fire and life safety education.
8. Complete the following tasks for O0000 Victim Search/Rescue.
   a. Identify situational awareness considerations for a structural search.
   b. Determine safety considerations during a structural search.
   c. Perform a basic victim search and removal methods in a rescue situation.
   d. Identify procedures for conducting primary/secondary searches.
   e. Demonstrate using various drags, lifts, and carries for victims.
9. Complete the following tasks for Q0001 Vehicle Rescue.
   a. Identify and demonstrate the methods for removing vehicle glass.
   b. Identify vehicle roof posts with the appropriate letter designation.

c. Demonstrate the removal of vehicle doors and roofs.

10. Complete and refine tasks for FC10000 KY FF Survival as learned in 461031 Firefighting Basic Skills III.
11. Complete and refine tasks for FC20000 KY FF Rescue as learned in 461031 Firefighting Basic Skills III.
12. Review OSHA (Occupational Safety and Health Administration) requirements for “2 in and 2 out”.

Internship (Fire Service/EMT) 461068

Internship provides supervised on-the-job work experience related to the student's education objectives. Students participating in the Internship program do not receive compensation for their work. Work-based learning is designed to complement the classroom instruction. Students will be required to follow program and agency requirements for attendance and health screenings.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Develop written and oral communication skills.

Introduction to Fire Service 461033

This course includes Kentucky Fire Commission Training topics A0000 Administration and Organization, D0000 Fire Behavior, B0000 Safety, F0000 Personal Protective Equipment, E0000 Extinguishers, and K0000 Hose, Nozzles, and Appliances.

Recommended Grade Level: 9 – 11

Recommended Credit: 1

Students will:

1. Complete the following tasks for A0000 Administration and Organization.
   a. Describe the organization of the fire department.
   b. Explain the Firefighter I's role as a member of the organization.
   c. Explain the mission of the fire service and of the local fire department.
   d. Explain the function of Standard Operating Procedures.
   e. Explain fire department rules and regulations that apply to the position of Firefighting.
   f. Explain the components of and the firefighter's role within the local incident management system.
   g. Explain the role of other agencies that may respond to emergencies.
   h. Describe the components of a member assistance program.
2. Complete the following tasks for D0000 Fire Behavior.
   a. Define fire.
   b. Define fire triangle and tetrahedron.
   c. Recognize the various conditions related to three stages of three conditions of fire and their associated hazards.
   d. Identify three products of combustion found in structural fires that create life hazards.
   e. Define the three methods of heat transfer.
   f. Define the three physical states of matter in which fuels are commonly found.
   g. Define the relationship of the concentrations of oxygen to combustibility and life safety.
   h. Describe the process of thermal layering that occurs in structural fires and how to avoid disturbing the normal layering of heat.
3. Complete the following tasks for B0000 Safety.
   a. Describe the responsibility of a firefighter as referenced by NFPA (National Fire Protection Association) 1500.
   b. Describe the elements of a personnel accountability system and demonstrate the application of the system at an incident.
   c. Identify dangerous building conditions created by fire.
   d. Demonstrate techniques for action when trapped or disoriented in a fire situation or in a hostile environment.
   e. Explain hazard related to electrical emergencies.
   f. Demonstrate safety procedures when using fire services lighting equipment.
   g. Demonstrate the use of seat belts, noise barriers, and other safety equipment providing protection while riding on apparatus.

h. Demonstrate safety procedures when mounting, dismounting and operation around fire apparatus.
i. Shut off the utility services to a building.
j. Identify a minimum of three common types of accidents or injuries, and their cause that occur in various fire department activities.
k. Identify safety procedures for ensuring a safe station/facility environment.
l. Identify potential long-term consequences of exposure to products of combustion.

4. Complete the following tasks for F0000 Personal Protective Equipment.
   a. Identify the function of the following articles of protective equipment:
      i. Helmet with eye shield
      ii. Hood
      iii. Boots
      iv. Gloves
      v. Protective trousers
      vi. Protective coats
      vii. Self-Contained Breathing Apparatus (SCBA)
      viii. Personal Alert Safety System (PASS), and
      ix. Eye protection.
   b. Identify and demonstrate the care, use, inspection, maintenance, and limitations of protective clothing and equipment.
   c. Demonstrate the donning of protective equipment.
   d. Identify hazardous environment that require respiratory protection.
   e. Identify the physical requirements of a Self-Contained Breathing Apparatus (SCBA) wearer.
   f. Describe the uses and limitations of Self-Contained Breathing Apparatus (SCBA).
   g. Identify each component and safety feature of Self-Contained Breathing Apparatus (SCBA).
   h. Describe the function of each component of Self-Contained Breathing Apparatus (SCBA).
   i. Assure that Self-Contained Breathing Apparatus (SCBA) is in a safe condition for immediate use.
   j. Demonstrate the use of Self-Contained Breathing Apparatus (SCBA) under the conditions of obscured visibility and restricted passage.
   k. Demonstrate the procedures for Self-Contained Breathing Apparatus (SCBA) use: emergency by-pass valve, conservation of air, regulator breathing, maximum use of air under working conditions, and cylinder replacements.
   l. Demonstrate and document routine maintenance for Self-Contained Breathing Apparatus (SCBA), including inspection, cleaning, sanitizing, and cylinder recharging.
   m. Demonstrate rescue procedures for the following:
      i. A firefighter with functioning respiratory protection;
      ii. A firefighter without functioning respiratory protection; and
      iii. A civilian without respiratory protection.
5. Complete the following tasks for E0000 Extinguishers.
   a. Identify the classification of fires as they relate to fire extinguishers.
   b. Define the portable extinguishers rating systems.

c. Identify the appropriate extinguishers and the application procedures for the various classes of fire, given a group of different extinguishers.
d. Extinguish Class A and B fires using the proper fire extinguishers.

6. Complete the following tasks for K0000 Hose, Nozzles, and Appliances.
   a. Describe the application of each size and type of hose on a pumper as required to be carried by NFPA (National Fire Protection Association) 1901.
   b. Demonstrate the use of nozzles, adapters, and hose appliances and tools on a pumper as required by NFPA (National Fire Protection Association) 1901.
   c. Advance uncharged and charged attack lines of two different sizes of 1 ½ inch or larger, from a pumper, for the following evolutions:
      i. Into a structure;
      ii. Up a ladder to a second floor landing;
      iii. Up an inside stairway to an upper floor;
      iv. Up an outside stairway to an upper floor;
      v. Down an inside stairway to a lower floor;
      vi. Down an outside stairway to a lower floor; and
      vii. To an upper floor by hoisting.
   d. Demonstrate the following given fire hose used for fire attack and water supply:
      i. Three types of hose loads and finishes;
      ii. Three types of hose rolls;
      iii. Coupling and uncoupling two lengths;
      iv. Two hose carries extending hose lines; and
      v. Replacing burst sections of hose.
   e. Demonstrate operations of a charged attack line 1 ½ inch or larger from ground ladder.
   f. Demonstrate carrying a 100-foot attack line 1 ½ inch or larger into a building, connecting it to a standpipe, and advancing the line from the standpipe.
   g. Demonstrate a hand lay of 300 feet of supply line 2 ½ inch or larger from a pumper to a water source.
   h. Define a fire steam.
   i. Define water hammer and at least one method of its prevention.
   j. Demonstrate how to open and close a nozzle and how to adjust its stream pattern and flow setting, when applicable.
   k. Identify the type, design, operation, required nozzle pressure, and flow for a given selection of nozzles and tips.
   l. Define the following methods of water applications: direct, indirect, combination.
   m. Identify precautions to be followed while advancing hose lines to a fire.
   n. Identify three observable results that are obtained when the proper application of a fire stream is accomplished.

Special Topics – Fire Service 461069

Special Topics is an expanded course offering the study of emergency and fire service issues. Topics may vary at the discretion of the instructor.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Tasks will be developed by the instructor related to the project to be completed.
2. Tasks will include practice in written and oral communications.

MANUFACTURING TECHNOLOGY EDUCATION

COMPUTER-AIDED DESIGN (CAD) CAREER PATHWAYS

Architectural Technology CIP 15.1301.03

Architectural technology utilizes mathematical and scientific principles to draw building layouts including structural, HVAC, lighting, plumbing and electrical systems while addressing issues that include functionality, safety and economic factors. Architectural drafters need to be able to draw designs manually, as well as through computer-aided drafting (CAD). Additional concerns are site considerations and building codes.

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Complete (3) three credits:

- 480110 Introduction to Computer-Aided Drafting
- 480117 Introduction to Architecture
- 480116 Architectural Design

Choose (1) one credit from the following:

- 480127 Industrial Drafting Processes
- 480113 Engineering Graphics
- 470924 Advanced Dimensioning and Measurement
- 480179 Special Problems (CAD)
- 480112 Intermediate Computer-Aided Drafting
- 480145 Internship (CAD) **OR** 480142 Co-op I (CAD)

Civil Designer CIP 15.1301.01

Civil Designers apply technical knowledge and skills to develop working drawings and electronic simulations in support of civil engineers, geological engineers, and related professionals. This pathway includes instruction in basic civil engineering principles, geological and seismographic mapping, machine drafting, computer-aided drafting (CAD), pipe drafting, survey interpretation, and blueprint reading.

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Complete (3) three credits:

- 480110 Introduction to Computer-Aided Drafting
- 480112 Intermediate Computer-Aided Drafting
- 480104 Introduction to Surveying (For CAD) (.5-1 credits) **OR** 480113 Engineering Graphics

Choose (1) one credit from the following:

- 480127 Industrial Drafting Processes
- 480136 Parametric Modeling
- 480145 Internship (CAD)
- 480135 Mechanical Design
- 480142 Co-op I (CAD)
- 480179 Special Problems (CAD)

Manufacturing TRACK CIP 48.0500.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from the partnering technical center's manufacturing course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, visit the TRACK website.

Mechanical Designer CIP 15.1301.02

Mechanical designers have a working knowledge of mechanical parts, as well as computer-aided design (CAD) software, such as AutoCAD and SolidWorks. Mechanical designers work with project managers, engineers, and clients to understand the needs and requirements for a new product or mechanical system. Once materials and specifications have been determined, designers begin using CAD software to plan and develop models.

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Complete (3) three credits:

- 480110 Introduction to Computer-Aided Drafting
- 480136 Parametric Modeling
- 480113 Engineering Graphics

Choose (1) one credit from the following:

- 480135 Mechanical Design
- 480127 Industrial Drafting Processes
- 470924 Advanced Dimensioning and Measurement
- 480112 Intermediate Computer-Aided Drafting
- 480145 Internship (CAD) **OR** 480142 Co-op I (CAD)
- 480179 Special Problems (CAD)

COMPUTER-AIDED DESIGN COURSES

Advanced Dimensioning and Measurement 470924

This course presents an in-depth study of advanced industrial dimensioning principles, tolerances, fits, and ANSI (American National Standards Institute) standards. It also explores the shape and geometric characteristics of parts through geometric tolerance.

Prerequisite: Engineering Graphics 480113

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Define terms and principles used in advanced dimensioning.
2. Apply drawing practices and tolerance dimensioning on mating parts.
3. Explain and work with ANSI (American National Standards Institute) standards.
4. Demonstrate surface texture symbols and surface finish.
5. Compare conventional tolerancing with Geometric Dimensioning and Tolerancing.
6. Establish a basic understanding of Geometric Dimensioning and Tolerancing.
7. Analyze specific graphic designs and determine the proper location for dimensions.
8. Define terms and principles relating to Dimensional Metrology.
9. Demonstrate a working knowledge of basic handheld measuring instruments.
10. Measure with basic handheld measuring instruments.
11. Explain the relationship of precision measurement to manufacturing and design.
12. Demonstrate a working understanding of one-tenth of an inch and one-thousandth of an inch.

Architectural Design 480116

This course combines the elements and fundamentals of architectural design with the theory and application of presentation techniques. It deals with site selection, use of materials in design, spatial relationships, and aesthetics. Traditional and contemporary design, designers, processes, and historical milestones are explored. Board and computer techniques are used in illustrating student designs.

Prerequisites: Introduction to Architecture 480117

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Identify symbols and materials used on all drawings.
3. Draw a residential floor plan.
4. Use appropriate dimensioning techniques and architectural drawing standards.
5. Use drafting references and vendor product catalogs.
6. Draw residential elevations.
7. Draw and dimension presentation elevations.
8. Construct accompanying drawings to the floor plan, including foundation, framing, electrical, plumbing, heating, ventilation, and air conditioning.
9. Identify material representations in plan and section views.

Construction Drafting (Techniques) 480119

This lecture and lab course covers the elements for constructing standard, residential, and commercial buildings. Wood frame, solid masonry, veneer, concrete, and steel construction details are explored. Students will learn essentials of standard construction details which illustrate the various construction methods and will develop a portfolio for those techniques.

Prerequisite: Introduction to Computer-Aided Drafting 480110

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Construct residential foundation plans.
3. Construct residential floor framing plans.
4. Construct residential wall framing plans.
5. Construct residential roof framing plans.
6. Construct detailed drawings of reinforced concrete.
7. Construct detailed drawings of typical wood frame sections.
8. Construct detailed drawings of concrete blocks and masonry units.
9. Draw stair plans and details.
10. Draw fireplace plans and sections.
11. Construct cross section for residential plan.
12. Construct section drawings of roofs and parapets.

Co-op I (CAD) 480142

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work. This course can be repeated.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests prior to graduation.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential after graduation.
7. Earn funds to help finance education expenses.

Engineering Graphics 480113

This course includes exploration of lines and planes as they relate to orthographic projection to show the size and shape of objects. Instruction includes application of principles and graphic elements of sectioning to show interior detail; the techniques involved in creating oblique projections, axonometric projections, and perspective drawings; and the dimensioning techniques and symbol usage common to all drafting disciplines.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the work area.
2. Construct drawings of basic sectional views.
3. Apply dimensioning techniques.
4. Construct title blocks, revision blocks, materials list, and tolerancing blocks.
5. Freehand sketch orthographic and pictorial views.
6. Construct axonometric drawings.
7. Construct oblique drawings.
8. Construct one-point perspective.
9. Construct two-point perspective.

Industrial Drafting Processes 480127

This course explores weldment design, welding symbols, welding processes, and fabrication techniques, tool and die, and jig and fixture drawings. Design specifications, pattern drawings, casting, forming processes, and mechanical drawing principles in relation to the manufacturing industry, screw-thread design, and related fastening concepts as they relate to manufactured items and construction are also included.

Prerequisite: Introduction to Computer-Aided Drafting 480110

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Identify and use welding symbols on fabrication drawings.
3. Construct welding assembly drawings.
4. Construct casting drawings.
5. Construct forging drawings.
6. Construct jig and fixture drawings.
7. Construct tool and die drawings.
8. Identify, specify, and construct drawings of fasteners.
9. Construct and dimension keyway and keyseat drawings.
10. Construct detailed, schematic and simplified thread drawings.
11. Construct spring drawings.

Intermediate Computer-Aided Drafting 480112

Students will use CAD software to produce advanced two- and three-dimensional object drawings; advanced techniques of drafting, layering, and symbols associated with one or more design applications; calculations of perimeters, areas, and mass associated with the drawings. (Project Lead the Way Component)

Prerequisite: Introduction to Computer-Aided Drafting 480110

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in all areas at all times.
2. Demonstrate, through practice and communications, a comprehensive working knowledge of CAD drafting and the drafting symbols associated with one or more design applications.
3. Produce complex drawings through use of CAD techniques.
4. Use CAD to calculate perimeters and areas for design features.
5. Construct three-dimensional models using various techniques.
6. Project two-dimensional orthographic and axonometric views and sections off of the three-dimensional models.
7. Use advanced CAD operations.

Internship (CAD) 480145

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the internship do not receive compensation.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1 - 3

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests prior to graduation.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential after graduation.

Introduction to Architecture 480117

This course provides a practical approach to architectural drafting through an introduction to board and computer-aided drafting as it relates to residential and commercial architecture, specifications, and structural systems including wood, masonry, concrete, and steel.

Prerequisite: Introduction to Computer-Aided Drafting 480110

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Use proper drawing setup for architectural scales.
3. Relate the design with site considerations.
4. Sketch a residential floor plan.
5. Identify floor plan symbols.
6. Identify material representations in plan and section views.
7. Apply basic dimensioning techniques.
8. Construct accompanying drawings to the floor plan such as elevations and electrical plans.

Introduction to Computer-Aided Drafting 480110

Students will use a computer graphic workstation in the application of fundamental principles and capabilities of CAD, basic drafting conventions, and operations. An in-depth study of computer-aided drafting commands, terminology, command utilization, and skill development will be provided.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Demonstrate an understanding of orthographic projection, section, auxiliary, and pictorial views as they relate to three-dimensional objects.
3. Identify the alphabet of lines and name each line's use.
4. Use architects, metric, civil, and mechanical drafter's scales.
5. Understand the use and purpose of a title block.
6. Demonstrate a basic understanding of dimensions and their uses.
7. Describe, using correct computer terminology, basic computer functions, uses of computers in society, and different types of software.
8. Discuss ethical computing issues such as copyright, privacy, security, and property.
9. Use graphical user interface.
10. Use computer application programs.
11. Access information sources found on networks such as the Internet and utilize web browsers, search sources, and sources of information related to his or her own field.
12. Demonstrate an awareness of different types of software applications.
13. Produce line entities using various coordinate techniques.
14. Construct geometric shapes in two-dimensional space.
15. Develop detailed orthographic views as required.
16. Construct cross sections of various designs with cross-hatching incorporated as desired.
17. Apply dimensions and annotations to drawings.
18. Move, copy, delete, and save drawings or portions of drawings.
19. Use CAD to manipulate drawings by means of translation, rotation, scaling, zooming, panning, and windowing.
20. Explore three-dimensional drawing techniques.

Introduction to Surveying (For CAD) 480104

Students are introduced to the elements of surveying including measurements, distance corrections, leveling, angles, area computation, computer calculations, topographic surveying, and electronic distance measuring instruments, construction surveying, GPS, and GIS.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Identify surveying methods and notations of measurements.
3. Analyze correction of error.
4. Identify surveying instruments.
5. Identify various methods of leveling.
6. Explain methods of traverse calculations and area computation.
7. Analyze computer calculations and omitted measurements.
8. Identify various types of surveys.
9. Explain Global Positioning System and Geographic Information Systems.
10. Identify volumes and horizontal and vertical curves.

Mechanical Design 480135

Students will explore the design process involved in the development of mechanical working drawings and the design principles in various manufacturing disciplines; gear drawing and design, and cam and follower drawing and design; design principles, mechanical adaptation, and their drawing practices; mechanical assemblies, machine design, power transmission, bearings, and seals in assemblies; and shop processes involved in these mechanical designs.

Prerequisite: Introduction to Computer-Aided Drafting 480110

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Construct mechanical working drawings.
3. Construct gear drawing and design.
4. Construct cam and follower drawings.
5. Solve mechanical problems related to gears and cams.
6. Select appropriate gears from vendor catalogs.
7. Construct mechanical power transmission drawings.
8. Construct assembly drawings using bearings and seals.
9. Demonstrate knowledge of shop processes.

Parametric Modeling 480136

This course introduces Parametric Modeling and Design in CAD. The course explores the techniques associated with drafting and design using parametric modeling software. It also introduces the creation of parametric models and explores associative function and flexibility of concurrent part design.

Prerequisite: Introduction to Computer-Aided Drafting 480110 **OR** Intermediate Computer-Aided Drafting 480112

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Demonstrate an awareness of the terminology and concepts of Parametric Modeling.
3. Demonstrate basic parametric modeling procedures.
4. Demonstrate the ability to create parametric sketches.
5. Create fully constrained sketches.
6. Apply/modify geometric constraints and dimensions to capture and alter the design geometry of the part.
7. Demonstrate through practice, the construction of simple parametric solid models.
8. Demonstrate the ability to perform feature-based modeling operations on parts.
9. Perform analyses on the model.
10. Perform simple assembly modeling.
11. Create desired working drawing layouts and dimensioned views from parametric solids.

Special Problems (CAD) 480179

This course allows the student to gain intermediate experience in their perspective fields through projects and tasks assigned by the instructor and based on applications the student may experience as a professional. It sets the foundation for more in-depth projects that will be included in the student's future portfolio and focuses on various assignments and curriculum as determined by the program instructor. This course does not count toward preparatory status.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits in the lab area.
2. Expand the portfolio of CAD drawings to enhance career opportunities.
3. Discuss occupation opportunities.

COMPUTERIZED MANUFACTURING and MACHINING CAREER PATHWAYS

Computer Numerical Control (CNC) Operator CIP 48.0503.04

CNC operators monitor and operate CNC (computer numerically controlled) machines to cut metal and plastic parts for the manufacturing industry. They select and download CNC programs and perform test operations to ensure the product is made to specifications. The CNC operator may be responsible for selecting and setting all tools required for producing the final precision part to customer specifications.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 470913 Fundamentals of Machine Tools-A
- 470914 Fundamentals of Machine Tools-B
- 470915 Manual Programming
- 470925 CAD/CAM/CNC
- 470921 Blueprint Reading for Machinists
- 480110 Introduction to Computer-Aided Drafting
- 470929 Co-op (Machine Tool) **OR** 470932 Internship (Machine Tool)

Machinist Operator CIP 48.0503.02

Machine operators are responsible for producing precision machined parts. They measure parts with precision tools in order to make sure certain parts meet pre-determined quality and cosmetic standards. When parts have passed inspection, the parts go on to the next phase of production. Machine operators are expected to meet production quotas. The level of documentation required varies, depending on the degree of precision needed for the finished product. Machine operators also need to keep track of the number of units that are scrapped due to various errors.

BEST PRACTICE COURSES

Complete (2) two credits:

- 470913 Fundamentals of Machine Tools-A
- 470914 Fundamentals of Machine Tools-B

Choose (2) two credits from the following:

- 470921 Blueprint Reading for Machinists
- 470911 Applied Machining I
- 470912 Applied Machining II
- 470915 Manual Programming
- 480110 Introduction to Computer-Aided Drafting
- 470922 Mechanical Blueprint Reading (.5 credit)
- 470928 Metrology/Control Charts (.5 credit)
- 470929 Co-op (Machine Tool) **OR** 470932 Internship (Machine Tool)

Manufacturing TRACK CIP 48.0500.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from the partnering technical center's manufacturing course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to TRACK website.

COMPUTERIZED MANUFACTURING and MACHINING COURSES

Advanced Dimensioning and Measurement 470924

This course presents an in-depth study of advanced industrial dimensioning principles, tolerances, fits, and ANSI (American National Standards Institute) standards. It also includes the exploration of the shape and geometric characteristics of parts through geometric tolerance.

Prerequisite: Fundamentals of Machine Tool A 470913

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Define terms and principles used in advanced dimensioning.
5. Apply drawing practices and tolerance dimensioning on mating parts.
6. Explain and work with ANSI (American National Standards Institute) standards.
7. Demonstrate surface texture symbols and surface finish.
8. Compare conventional tolerance with Geometric Dimensioning and Tolerance.
9. Establish a basic understanding of Geometric Dimensioning and Tolerance.
10. Analyze specific graphic designs and determine the proper location for dimensions.
11. Define terms and principles relating to Dimensional Metrology.
12. Demonstrate a working knowledge of basic hand held measuring instruments.
13. Measure with basic hand-held measuring instruments.
14. Explain the relationship of precision measurement to manufacturing and design.
15. Demonstrate a working understanding of one-tenth of an inch and one-thousandth of an inch.

Applied Machining I 470911

This course consists of intermediate level skills using machining equipment and surface grinders. It will include the selection of grinding wheels. Applications in milling, lathe, bench work, and utilizing gauge blocks and the sine bar are covered in this course. Surface grinding and abrasives are introduced and properties of metals are discussed.

Prerequisites: Fundamentals of Machine Tool A 470913 **AND** Fundamentals of Machine Tool B 470914

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Machine and finish holes on the milling machine.
5. Cut and finish different types of key seats.
6. Select and use different types of milling cutters.
7. Select and perform basic grinding operation.
8. Machine holes on a vertical mill.
9. Form mill on a vertical mill.
10. Mill key seats.
11. Mill an angle on a vertical mill.
12. Demonstrate the care and safe use of machine grinders.
13. Select grinding wheels.
14. Classify metals and metal shapes.

Applied Machining II 470912

This course prepares the student for a higher level in the operation of machine tools. Applications in milling, lathe, bench work, gauge blocks, and the sine bar are covered in this course. Surface grinding and abrasives are introduced and properties of metals are discussed.

Prerequisite: Applied Machining I 470911

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Perform the grinding of parts with surfaces that are flat, parallel, and perpendicular.
5. Perform the machining of tapers on mills and lathes.
6. Perform plunge cutting operations.
7. Perform the knurling on the lathe.
8. Operate a surface grinder.
9. Mount, balance, and dress grinding wheels.
10. Cut tapers.
11. Chase standard threads on the lathe.
12. Chase metric threads on the lathe.

Blueprint Reading for Machinists 470921

This course provides the student with a beginning and advanced series of lectures, demonstrations, and practice exercises in the study of prints. Safety will be emphasized as an integral part of this course.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate competency in mathematical fraction and decimal problems.
5. Identify the alphabet of lines.
6. Identify multiple views.
7. Arrange multiple views.
8. Arrange two-view drawings.
9. Identify one-view drawings.
10. Arrange and identify auxiliary views.
11. Demonstrate the use of size and location dimensions.
12. Demonstrate proper dimensions of cylinders and arcs.
13. Size dimensions of holes and angles.
14. Locate dimensions for centering of holes, points, and centers.
15. Interpret the base line dimensions on drawings.
16. Calculate tolerances.
17. Identify labeling of various screw threads.
18. Calculate tapers and machined surfaces.
19. Dimension parts using shop notes.
20. Identify half, full, and removed sections.
21. Interpret ordinate and tabular dimensions.
22. Set tolerances using geometric dimensioning techniques.
23. Sketch parts with irregular shapes.
24. Sketch oblique views of various parts.
25. Sketch and dimension shop drawings.
26. Demonstrate visualizing techniques of multiple views.
27. Identify line types used in combinations.
28. Identify standards listings on working drawings.
29. List procedural machining and construction requirements from notations on working drawings.
30. List proper procedure for construction of various machining processes.
31. Determine proper thread series and types for duty specific assembly.

32. Specify duty specific uses of contour notes.
33. Determine overall measurements of contoured parts.
34. Explain various terms involved in multiple sections.
35. Identify usages for chamfers and interpret sizes.
36. Define various chamfer terms.
37. Determine the sizing procedures of necks and grooves.
38. Identify various keyway and key seat standards.
39. Identify usage of geometric symbols.
40. Define terms relating to geometric tolerance.
41. Set standards and tolerances using geometric dimensioning.
42. Set axis coordinates on numerical control prints.
43. Determine axis coordinates on ordinate and tabular prints.
44. Identify casting and forging terms.
45. Calculate bend setbacks in sheet metals and plate steels.
46. Identify parts and materials from various reference books and manuals.

CAD/CAM/CNC 470925

This course introduces the student to CAD/CAM/CNC systems which includes CAM software. The student will utilize process planning, manual programming and CAD/CAM for CNC equipment. The student will load a CNC program and set tool and work offsets and machine part.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Perform routine maintenance on tools, equipment, and machines.
5. Demonstrate knowledge of manual data input on CNC machines.
6. Create a roughing tool path for milling applications.
7. Enter tool offsets and cutter geometry and work offset.
8. Test and run a program.
9. Create a thread element, grooving and roughing for turning.
10. Use fixed cycles on CNC machines.
11. Use an automatic tool changer.
12. Work with sub-routines.
13. Generate code from converted CAD geometry.
14. Use the CAM system to transfer CAD geometry, RS – 232, DNC link.
15. Use process planning for CNC equipment.
16. Create drawings on CAM software.
17. Load a CNC program and set tool and work offsets.
18. Generate code using CAM software.
19. Operate CNC equipment.

Conversational Editing and Subroutines 470927

This course introduces students to performing editing routines to subroutines and to programs that contain loops. Students will also interpret error messages from the control.

Prerequisite: Introduction to Conversational Programming 470926

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Identify preventative measures.
5. Identify hazardous materials.
6. Practice safe use of CNC milling machines.
7. Use conversational programming of CNC machine tools.
8. Complete projects using the skills obtained in the classroom in work situations.
9. Write a conversational program.
10. Troubleshoot the program and correct mistakes.
11. Identify errors and correct them in programs.
12. Improve programs.
13. Write programs by hand.
14. Perform machining operations using programs written by hand.
15. Edit existing programs.
16. Edit existing blocks in programs.
17. Interpret error messages from the control.
18. Demonstrate knowledge of when to use and when not to use polar coordinates.
19. Calculate X, Y, OR Z and I, J, or K points using the Pythagorean Theorem and trigonometry.
20. Write a program containing subroutines.
21. Write a program containing loops.

Co-op (Machine Tool) 470929

Co-op provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the cooperative education program receive compensation for their work. This course can be repeated.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Gain career awareness and the opportunity to test career choices.
5. Receive work experience related to career interests prior to graduation.
6. Integrate classroom studies with work experience.
7. Receive exposure to facilities and equipment unavailable in a classroom setting.
8. Increase employability potential after graduation.
9. Earn funds to help finance education expenses.

Fundamentals of Machine Tools – A 470913

This course provides the basic principles needed for a solid foundation in machine tool technology. Areas and machines covered include shop safety, bench work, drill press, power saw, measurement, mills, and lathes.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Perform bench work processes, hacksaw, files, layout, drill, tap and other activities to meet industry standards.
5. Perform safe and functional activities on the following machines: horizontal band saw, vertical band saw, drill press, arbor press, lathes, and mills.
6. Perform tasks with cutting hand tools and non-cutting hand tools.
7. Identify and explain the handling procedure for hazardous material and the MSDS.
8. Identify safety needs and regulations in a machine shop.
9. Identify non-cutting hand tools and the proper use of them.
10. Prepare for a bench work process.
11. Hand saw with a hacksaw.
12. Bench file the work piece.
13. Dress and true grinding wheels on bench and pedestal grinders.
14. Demonstrate knowledge of power saws, parts, and applications.
15. Demonstrate the care and safe use of the power saw.
16. Cut and weld band saw blades.
17. Perform operations on the cut-off saw.
18. Perform operations on the vertical band saw.
19. Demonstrate knowledge of drill press, parts, and applications.
20. Demonstrate the care and safe use of the drill press.
21. Calculate and set the cutting speed and feed on the drill press.
22. Sharpen drills.
23. Set up a drill press and drill holes.
24. Shape and finish holes on a drill press.
25. Tap holes by hand and machine on a drill press.
26. Thread by hand with taps and dies.
27. Operate an arbor press.
28. Use chisels and punches.
29. Demonstrate knowledge of hazardous materials handling.
30. Demonstrate knowledge of hazardous materials storage.
31. Demonstrate lock-out/tag-out procedures.
32. Demonstrate use of MSDS.

33. Measure with basic hand-held measuring instruments.

Fundamentals of Machine Tools – B 470914

This course provides intermediate skill development in machine tool technology. The course builds on basic skills especially in the calculation of safe cutting speed and feed rates for the drill press, power saw, mills, and lathes. Shop safety, bench work, and precision measurement are also emphasized.

Prerequisite: Fundamentals of Machine Tools – A 470913

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate knowledge of lathes, parts, and applications.
5. Demonstrate the care and safe use of lathes.
6. Demonstrate use and knowledge of mill parts and applications.
7. Demonstrate knowledge of cutting tools.
8. Demonstrate knowledge of cutting fluids.
9. Identify and explain the handling procedure for hazardous material and the content of MSDS.
10. Calculate set speeds and feeds on a lathe.
11. Sharpen high speed tool bits.
12. Mount work piece on a lathe.
13. Face a work piece.
14. Perform turning operations.
15. Machine with carbide cutting tools.
16. File and polish a work piece.
17. Demonstrate knowledge of a milling machine, parts, and applications.
18. Demonstrate the care and safe use of milling machines.
19. Calculate set speeds and feeds on the milling machine.
20. Mill flat surfaces and grooves using a vertical mill.
21. Apply cutting fluid to machining operations.

Interdisciplinary Geometry and Computer-Aided Drafting (CAD) 480114

This course is designed to introduce the student to the customization of the CAD software. Menu creation and programming will be applied as it relates to the CAD program.

Prerequisite: Introduction to Computer-Aided Drafting 480110

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Utilize advanced CAD applications.
5. Develop basic programming techniques.

Internship (Machine Tool) 470932

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the internship do not receive compensation.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1 - 3

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Gain career awareness and the opportunity to test career choices.
5. Receive work experience related to career interests prior to graduation.
6. Integrate classroom studies with work experience.
7. Receive exposure to facilities and equipment unavailable in a classroom setting.
8. Increase employability potential after graduation.

Intermediate Computer-Aided Drafting 480112

This course uses CAD software to produce advanced two- and three-dimensional object drawings. Students are given the opportunity to practice advanced techniques of drafting, layering, and symbols associated with one or more design applications. Students calculate perimeters, areas, and mass associated with the drawings.

Prerequisite: Introduction to Computer-Aided Drafting 480110

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate, through practice and communications, a comprehensive working knowledge of CAD drafting and the drafting symbols associated with one or more design applications.
5. Produce complex drawings through use of CAD techniques.
6. Use CAD to calculate perimeters and areas for design features.
7. Construct three-dimensional models using various techniques.
8. Project two-dimensional orthographic and axonometric views and sections off of the three-dimensional models.
9. Use advanced CAD operations.

Introduction to Computer-Aided Drafting 480110

This course uses computer graphic workstation in the application of fundamental principles and capabilities of CAD, basic drafting conventions, and operations. Students participate in an in-depth study of computer-aided drafting commands, terminology, command utilization, and skill development.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate an understanding of orthographic projection, section, auxiliary, and pictorial views as they relate to three-dimensional objects.
5. Identify the alphabet of lines and name each line's use.
6. Use architects, metric, civil, mechanical drafter's scales.
7. Understand the use and purpose of a title block.
8. Demonstrate a basic understanding of dimensions and their uses.
9. Describe, using correct computer terminology, basic computer functions, uses of computers in society and different types of software.
10. Discuss ethical computing issues, such as copyright, privacy, security, and property.
11. Use graphical user interface.
12. Use computer application programs.
13. Access information sources found on networks such as the internet and become familiar with web browsers and search for information related to his or her field.
14. Demonstrate an awareness of different types of software applications.
15. Produce line entities using various coordinate techniques.
16. Construct geometric shapes in two-dimensional space.
17. Develop detailed orthographic views as required.
18. Construct cross sections of various designs, with cross-hatching incorporated as desired.
19. Apply dimensions and annotations to drawings.
20. Move, copy, delete, and save drawings or portions of drawings.
21. Use CAD to manipulate drawings by means of translation, rotation, scaling, zooming, panning, and windowing.
22. Explore 3-D drawing techniques.

Introduction to Conversational Programming 470926

This course introduces students to conversational programming guidelines, which will include program preparation, conversational input, and minor editing.

Prerequisites: Fundamentals of Machine Tools-A 470913 **AND** Fundamentals of Machine Tools-B 470914

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Identify and practice preventative measures.
5. Identify and explain the handling procedure for hazardous material.
6. Practice safe use of CNC milling machines.
7. Use conversational programming of CNC machine tools.
8. Complete projects using the skills obtained in the classroom in work situations.
9. Write a conversational program.
10. Troubleshoot the program and correct mistakes.
11. Respond to prompts.
12. Prepare a conversational program.
13. Edit existing conversational programs.
14. Perform machining operations using programs created by student.
15. Respond to prompts correctly to build a program.
16. Prepare a program in conversational language.
17. Compare conversational input to coded input.
18. Determine errors in programs and correct them.
19. Look for improvements in the process of a program.
20. Insert blocks of information into programs.
21. Delete blocks of information from programs.

Manual Programming 470915

This course introduces the student to CNC format and the Cartesian Coordinate System. It also introduces the student to CNC codes and programming, set-up, and operation of CNC machine tools. The student will utilize process planning and manual programming for CNC equipment. The student will load a CNC program and set tool and work offsets.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Use process planning for CNC equipment.
5. Use manual programming for CNC equipment.
6. Load a CNC program and set tool and work offsets.
7. Identify the tasks that must be done to put a job into production.
8. Use proper tool path sequencing.
9. Apply the “Rule of Thumb” to determine rotary axis direction and the “Right-Hand Rule.”
10. Describe the characteristics and differences between position and reference points.
11. Calculate coordinate points using absolute Cartesian values.
12. Calculate coordinate points using incremental Cartesian values.
13. Identify basic CNC code structure.

Mechanical Blueprint Reading 470922

This course provides the student with an advanced series of lectures, demonstrations, and practice exercises in the study of prints involving decimal and metric math, combination of lines, multi-view drawings, assembly drawings, fasteners, machining and construction processes, datum coordinates, numerical control prints, sheet metal prints, welding, casting and forging prints. Safety will be emphasized.

Prerequisite: Blueprint Reading for Machinists 470921

Recommended Grade Level: 11 - 12

Recommended Credit: .5

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate visualizing techniques of multiple views.
5. Identify line types used in combinations.
6. Identify standards listings on working drawings.
7. List procedural machining and construction requirements from notations on working drawings.
8. List proper procedure for construction of various machining processes.
9. Determine proper thread series and types for duty specific assembly.
10. Specify duty specific uses of contour notes.
11. Determine overall measurements of contoured parts.
12. Explain various terms involved in multiple sections.
13. Identify usages for chamfers and interpret sizes.
14. Define various chamfer terms.
15. Determine the sizing procedures of necks and grooves.
16. Identify various keyway and key seat standards.
17. Identify usage of geometric symbols.
18. Define terms relating to geometric tolerance.
19. Set standards and tolerances using geometric dimensioning.
20. Set axis coordinates on numerical control prints.
21. Determine axis coordinates on ordinate and tabular prints.
22. Identify casting and forging terms.
23. Calculate bend setbacks in sheet metals and plate steels.
24. Identify parts and materials from various reference books and manuals.

Metrology/Control Charts 470928

This course provides the basic principles in using precision measurement instruments and their application to inspection and quality control.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate and practice correct use of gauging equipment.
5. Demonstrate use of gauging equipment in part inspection.
6. Demonstrate knowledge of common control chart information.
7. Use gauging equipment to supply control charts with chart information.
8. Discuss Coordinate Measuring Machine.
9. Demonstrate and practice correct use of optical comparator.
10. Demonstrate knowledge, skills and abilities of applied statistics as outlined in the NIMS Framework for Machining Skills.
11. Identify parts and materials from various reference books and manuals.

Special Problems (CMM) 470979

This is a course designed for the student who has demonstrated specific needs. This course does not count toward preparatory status.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Complete selected tasks/problems as determined by the instructor.

INDUSTRIAL MAINTENANCE TECHNOLOGY CAREER PATHWAYS

Electrical Technician CIP 47.0303.02

Electrical technicians apply electrical theory and related knowledge to diagnose and modify developmental or operational electrical machinery and electrical control equipment and circuitry in industrial or commercial plants and laboratories. They assemble and test experimental motor-control devices, switch panels, transformers, generator windings, solenoids, and other electrical equipment and components according to engineering data and knowledge of electrical principles.

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Complete (3) three credits:

- 470322 Industrial Maintenance Electrical Principles
- 470348 Industrial Maintenance Electrical Motor Controls
- 470330 Industrial Maintenance of PLC's

Choose (1) one credit from the following:

- 499925 Basic Troubleshooting (.5 credit)
- 470301 Shop Management (.5 credit)
- 499920 Basic Blueprint Reading (.5 credit)
- 470321 Fluid Power
- 470328 Welding for Maintenance
- 470318 Maintaining Industrial Equipment
- 470351 Robotics and Automation (For Maintenance)
- 470308 Internship (Ind Maint) **OR** 470305 Co-op I (Ind Maint)

Maintenance Machinist CIP 47.0303.03

Maintenance machinists set up and operate a variety of machine tools and fit and assemble parts to fabricate or repair machine tools and maintain industrial machines, applying knowledge of mechanics, shop mathematics, metal properties, layout, and machining procedures. They observe, listen to and diagnose operating machinery or equipment to correct machine malfunction and determine need for adjustment or repair.

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Complete (3) three credits:

- 470921 Blueprint Reading for Machinists
- 470313 Fundamentals of Machine Tools – A (For Maintenance) (.5 - 1 credits)
- 470314 Fundamentals of Machine Tools – B (For Maintenance) (.5 - 1 credits)

Choose (1) one credit from the following:

- 470360 Applied Machining I (for Industrial Maint.)
- 470301 Shop Management (.5 credit)
- 499925 Basic Troubleshooting (.5 credit)
- 499920 Basic Blueprint Reading (.5 credit)
- 470318 Maintaining Industrial Equipment
- 470328 Welding for Maintenance
- 470322 Industrial Maintenance Electrical Principles
- 470308 Internship (Ind Maint) **OR** 470305 Co-op I (Ind Maint)

Maintenance Mechanic CIP 47.0303.01

Maintenance Mechanics perform machine setup, troubleshooting, repairs and preventive maintenance service; including but not limited to mechanical, electrical, pneumatic and hydraulic systems for industrial production and processing machinery and equipment. They read and interpret equipment manuals and work orders to perform required maintenance and service as well as analyze and inspect equipment, structures, or materials to identify errors, problems or defects.

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Complete (2) two credits:

- 470322 Industrial Maintenance Electrical Principles
- 470318 Maintaining Industrial Equipment

Choose (2) two credits from the following:

- 470321 Fluid Power
- 470348 Industrial Maintenance Electrical Motor Controls
- 470330 Industrial Maintenance of PLCs (Programmable Logic Controllers)
- 499925 Basic Troubleshooting (.5 credit)
- 470301 Shop Management (.5 credit)
- 499920 Basic Blueprint Reading (.5 credit)
- 470351 Robotics and Automation (For Maintenance)
- 470328 Welding for Maintenance
- 470313 Fundamentals of Machine Tools – A (For Maintenance) (.5 – 1 credits)
- 470316 Advanced Hydraulic Systems
- 470326 Advanced Pneumatic Systems
- 470360 Applied Machining I (for Industrial Maint.)
- 470361 Cooling and Dehumidification (for Industrial Maint.)
- 470358 Electrical Components (Ind. Maint.)
- 470314 Fundamentals of Machine Tools – B (For Maintenance)
- 470363 Heating and Humidification (for Industrial Maint.)
- 470365 HVAC Electricity (for Industrial Maint.)
- 470349 Refrigeration Fundamentals (For Maintenance)
- 470308 Internship (Ind Maint) **OR** 470305 Co-op I (Ind Maint)

Manufacturing TRACK CIP 48.0500.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from the partnering technical center's manufacturing course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to the TRACK website.

Welding Maintenance Technician CIP 47.0303.06

Welding Maintenance Technicians layout, fabricate, set up and weld metals in all positions. Welding Technicians must operate all types of welding equipment and apply safety first and comply with all OSHA guidelines and regulations. They read blueprints, apply mechanical skills, calculate shop mathematics and know the metal properties to perform welding procedures to meet industry specifications. Additional skills that enhance employability opportunities are diagnosing operating machinery or equipment to correct machine malfunction and determine need for adjustment or repair.

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Complete (3) three credits:

- 470328 Welding for Maintenance
- 470354 Shielded Metal Arc Welding (For Maintenance)
- 470367 Gas Metal Arc Welding (Ind. Maint.)

Choose (1) one credit from the following:

- 499925 Basic Troubleshooting (.5 credit)
- 470322 Industrial Maintenance Electrical Principles
- 470318 Maintaining Industrial Equipment
- 470313 Fundamentals of Machine Tools – A (For Maintenance)
- 499920 Basic Blueprint Reading (.5 credit)
- 470301 Shop Management (.5 credit)
- 470308 Internship (Ind Maint) **OR** 470305 Co-op I (Ind Maint)

INDUSTRIAL MAINTENANCE TECHNOLOGY COURSES

Advanced Hydraulic Systems 470316

This course covers design, repair, and troubleshooting of hydraulic systems.

Prerequisite: Fluid Power 470321

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in machining.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Describe the properties of hydraulic fluid.
5. Describe how an accumulator performs in a circuit.
6. Install and operate an accumulator into a circuit.
7. Install and operate a pilot-operated check valve.
8. Install and operate a pressure-compensated flow control valve.
9. Install and operate a pilot-operated directional control valve.
10. Install and operate a pressure port check valve.
11. Install and operate a cam-operated valve.
12. Hook up and operate unloading circuits.
13. Install and operate by remote a pilot-operated pressure control valve.
14. Describe transducers.
15. Describe electrohydraulic servo valve characteristics.
16. Operate an electrohydraulic servo valve.
17. Install and align a hydraulic pump.
18. Repair a hydraulic cylinder.
19. Choose a hydraulic cylinder for a specific application.
20. Interpret hydraulic schematics.
21. Troubleshoot a hydraulic circuit.
22. Design a hydraulic circuit.
23. Repair valves.

Advanced Pneumatic Systems 470326

This course covers design, repair and troubleshooting of pneumatic systems.

Prerequisite: Fluid Power 470321

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Repair a pneumatic cylinder.
5. Choose a pneumatic cylinder for a specific application.
6. Interpret pneumatic schematics.
7. Construct basic air logic circuits.
8. Identify symbols and devices used in air logic circuits.
9. Install and operate a check valve.
10. Install and operate a four-way pilot-operated directional control valve (DCV).
11. Install and operate a push button DCV.
12. Install and operate a cam-operated DCV.
13. Design a pneumatic system.
14. Disassemble an air compressor.
15. Repair valves.
16. Troubleshoot a pneumatic system.
17. Test pneumatic components for proper operation.

Applied Machining I (for Industrial Maint.) 470360

This course consists of intermediate level skills using machining equipment and surface grinders. It includes the selection of grinding wheels. Applications in milling, lathe, bench work, and utilizing gauge blocks and the sine bar are covered in this course. Surface grinding and abrasives are introduced and properties of metals are discussed.

Prerequisites: Fundamentals of Machine Tools – A (For Maintenance) 470313 **AND** Fundamentals of Machine Tools – B (For Maintenance) 470314

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Machine and finish holes on the vertical and horizontal mills.
5. Cut and finish different types of key seats.
6. Select and use different types of milling cutters.
7. Select and perform basic grinding operations.
8. Machine holes on a vertical mill.
9. Form mill on a vertical mill.
10. Mill key seats.
11. Mill an angle on a vertical mill.
12. Cut and finish holes on vertical and horizontal mills.
13. Demonstrate the care and safe use of machine grinders.
14. Select grinding wheels.
15. Classify metals and metal shapes.

Basic Blueprint Reading 499920

This course presents basic applied math, lines, multi-view drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, threads and fasteners, and sketching typical to all shop drawings. Safety will be emphasized as an integral part of the course.

Recommended Grade Level: 9 - 12

Recommended Credit: .5

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Review math concepts (fractions and decimals).
5. Identify the alphabet of lines.
6. Identify multiple views.
7. Arrange multiple views.
8. Arrange two-view drawings.
9. Identify one-view drawings.
10. Arrange and identify auxiliary views.
11. Demonstrate and use the size and location dimensions.
12. Demonstrate proper dimensions of cylinders and arcs.
13. Size dimensions of holes and angles.
14. Locate dimensions for centering of holes, points, and centers.
15. Interpret the base line dimensions on drawings.
16. Identify half, full, and removed sections.
17. Identify electrical schematic and diagram symbols.
18. Identify welding symbols and equipment.
19. Interpret ordinate and tabular dimensions.
20. Set tolerances using geometric dimensioning techniques.
21. Sketch parts with irregular shapes.
22. Sketch oblique views of various parts.
23. Sketch and dimension shop drawings.
24. Dimension parts using shop notes.
25. Calculate tolerances.
26. Identify labeling of various screw threads.
27. Calculate tapers and machined surfaces.
28. Interpret connections and flow of various electrical, hydraulic, and pneumatic schematics and diagrams.

Basic Troubleshooting 499925

This course explores the science of troubleshooting and the importance of proper maintenance procedures; how to work well with others, aids in communication and trade responsibilities; examines actual troubleshooting techniques, aids in troubleshooting and how to use schematics and symbols; focuses on specific maintenance tasks such as solving mechanical and electrical problems, breakdown maintenance, and the hows and whys of planned maintenance.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: .5

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Explain the reason efficient troubleshooting is important in a production plant.
5. List the steps in troubleshooting a machine/system.
6. Demonstrate good communication skills when dealing with plant personnel.
7. List the questions that should be asked when a machine/system fails.
8. List the signs of a machine in need of service.
9. List the information that should be recorded in a machine equipment record.
10. Identify calibration standards.
11. Identify different troubleshooting test equipment.
12. Use schematics when troubleshooting.
13. Identify differences in schematics when troubleshooting.
14. Use a troubleshooting chart.
15. Identify bearing wear problems.
16. Identify pump failure problems and solutions.
17. Identify types of hosing.
18. Identify current voltage characteristics of wire.
19. Apply all safety rules when working with electrical equipment.
20. Identify a pictorial diagram, blocking diagram, and schematic diagram.
21. Demonstrate how to troubleshoot an electrical problem.
22. List preventive maintenance procedures.

Blueprint Reading for Machinists 470921

This course provides the student with a beginning and advanced series of lectures, demonstrations, and practice exercises in the study of prints. Safety will be emphasized as an integral part of this course.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate competency in mathematical fraction and decimal problems.
5. Identify the alphabet of lines.
6. Identify multiple views.
7. Arrange multiple views.
8. Arrange two-view drawings.
9. Identify one-view drawings.
10. Arrange and identify auxiliary views.
11. Demonstrate the use of size and location dimensions.
12. Demonstrate proper dimensions of cylinders and arcs.
13. Size dimensions of holes and angles.
14. Locate dimensions for centering of holes, points, and centers.
15. Interpret the base line dimensions on drawings.
16. Calculate tolerances.
17. Identify labeling of various screw threads.
18. Calculate tapers and machined surfaces.
19. Dimension parts using shop notes.
20. Identify half, full, and removed sections.
21. Interpret ordinate and tabular dimensions.
22. Set tolerances using geometric dimensioning techniques.
23. Sketch parts with irregular shapes.
24. Sketch oblique views of various parts.
25. Sketch and dimension shop drawings.
26. Demonstrate visualizing techniques of multiple views.
27. Identify line types used in combinations.
28. Identify standards listings on working drawings.
29. List procedural machining and construction requirements from notations on working drawings.
30. List proper procedure for construction of various machining processes.
31. Determine proper thread series and types for duty specific assembly.
32. Specify duty specific uses of contour notes.
33. Determine overall measurements of contoured parts.

34. Explain various terms involved in multiple sections.
35. Identify usages for chamfers and interpret sizes.
36. Define various chamfer terms.
37. Determine the sizing procedures of necks and grooves.
38. Identify various keyway and key seat standards.
39. Identify usage of geometric symbols.
40. Define terms relating to geometric tolerancing.
41. Set standards and tolerances using geometric dimensioning.
42. Set axis coordinates on numerical control prints.
43. Determine axis coordinates on ordinate and tabular prints.
44. Identify casting and forging terms.
45. Calculate bend setbacks in sheet metals and plate steels.
46. Identify parts and materials from various reference books and manuals.

Cooling and Dehumidification (for Industrial Maint.) 470361

This course explores the science of troubleshooting and the importance of proper maintenance procedures; how to work well with others, communication and trade responsibilities; actual troubleshooting techniques and how to use schematics and symbols; specific maintenance tasks such as solving mechanical and electrical problems and breakdown maintenance; and the hows and whys of planned maintenance.

Prerequisite: Refrigeration Fundamentals (For Maintenance) 470349

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Describe air conditioning.
5. List the benefits of "conditioned" air.
6. Describe some of today's current issues regarding air conditioning—industry concerns and future ramifications.
7. Describe the difference between split systems and package systems.
8. Describe the sequence of the basic refrigeration cycle and operation of the air conditioning system.
9. Use and read various tools and instrumentation needed for checking, testing, and operating air conditioning systems.
10. Define the types of condensers: air cooled, water cooled, and evaporative.
11. Adjust the air flow for proper temperature difference.
12. Describe maintenance of a condenser and a cooling tower.
13. Analyze air conditioning systems and appropriately diagnose the electrical and/or mechanical problems.
14. Demonstrate good customer relations in a classroom simulation.
15. Explain the importance of manufacturers' installation and operation requirements.
16. Determine equipment electrical requirements.
17. Verify equipment air flow and distribution requirements.
18. Check operation of all electrical components, including control components.
19. Demonstrate the use of tools and test equipment.
20. Check system operation while following all safety procedures.
21. Follow local codes and ordinances during installation and repair.
22. Read and demonstrate understanding of electrical wiring diagrams.
23. Develop a systematic way to diagnose system problems and demonstrate in class.
24. Determine the cause of failure in a system.
25. Identify and describe possible causes of failure and how to eliminate them.
26. Demonstrate the use of tools and test equipment while following safety practices.

27. Verify system operation.
28. Write a service report.
29. Identify types of control systems: electromechanical, pneumatic, electronic, and programmable.
30. Identify control system components.
31. Describe the sequences of operation in all types of control systems.
32. Construct a schematic diagram using all components necessary to safely operate an air conditioner.
33. Program a programmable thermostat for heating, cooling, and heat pump operation including set up and set back.
34. Plot and chart psychrometric terms.
35. Describe operation of electronic air cleaner.
36. Measure pressure drop with a magnetic gauge.

Co-op I (Ind Maint) 470305

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Gain career awareness and the opportunity to test career choices.
5. Receive work experience related to career interests prior to graduation.
6. Integrate classroom studies with work experience.
7. Receive exposure to facilities and equipment unavailable in a classroom setting.
8. Increase employability potential after graduation.

Electrical Components (Ind. Maint.) 470358

This course defines the electrical components of an air conditioning system. Different types of line voltages, wiring diagrams, and solid-state devices are included. Safety is emphasized.

Prerequisites: HVAC Electricity (Ind Maint) 470365 **OR** Industrial Maintenance Electrical Principles 470322 **AND** Industrial Maintenance Electrical Motor Controls 470348

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Measure voltage with digital and analog voltmeters.
5. Measure AC current with a clamp-on ammeter.
6. Measure resistance with an ohmmeter.
7. Check winding insulation with a megohmmeter.
8. Check voltage with a voltage test.
9. Use a continuity tester to determine whether an open circuit exists.
10. Use a capacitance meter to measure capacitance of both run and start capacitors.
11. Define watts, ohms, volts, and amps.
12. Define and compare single and multi-phase voltage and current.
13. Demonstrate proper use of ohmmeter, ammeter, and voltmeter.
14. Calculate electrical circuit loads.
15. Use appropriate meters to check fuses and breakers.
16. Use appropriate meter to determine wattage, resistance, voltage, and amperage.
17. Interpret tables and charts from National Electrical Code (NEC).
18. Figure wire sizes and voltage drop.
19. Draw and identify power transformer types.
20. Use electrical meters appropriately to test and identify voltages and phase.
21. Size and test fuses and breakers and safely replace them.
22. Use NEC tables to size EMT.
23. Define relays, sequencers, contractors, capacitors, defrost timers, crankcase heaters, water valves, damper actuators, thermostats, controllers, rheostats, zone valves, and solenoids.
24. Explain the operation and application of split phase motors, three phase motors, variable speed motors, shaded pole motors, and permanent split capacitor motors.
25. Demonstrate proper use of testing equipment for motors.
26. Interpret detailed instructions for wiring circuits.
27. Draw electrical circuits in accordance with standard wiring procedures.
28. Wire actual electrical circuits from wiring diagrams.
29. Demonstrate the use of basic electrical meters by wiring and testing actual circuits.

30. Explain the use of various electrical components in HVACR.
31. Interpret schematic wiring diagrams into a sequence of operation for HVACR equipment.
32. Analyze the electrical performance of each component and control.
33. Rewire a HVACR unit using a schematic diagram.
34. Develop an approved routine for electrical troubleshooting.
35. Use electrical test instruments appropriately to test and correct the performance of electrical systems.

Fluid Power 470321

This course is a study of fluid power theory, component identification and application, schematic reading, and basic calculations related to pneumatic and hydraulic systems and their operations.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Design simple hydraulic and pneumatic systems.
5. Draw hydraulic and pneumatic circuits.
6. Install pneumatic pressure regulator.
7. Check and replace pneumatic pressure regulator.
8. Install pressure relief valve.
9. Check and replace pressure relief valve.
10. Install non-rotating cylinder.
11. Install hydraulic and pneumatic motors.
12. Install pressure booster (intensifier).
13. Install pressure reducing valve.
14. Install rotating cylinder.
15. Replace 2-way, 3-way, and 4-way valves (solenoid operated valves).
16. Replace an accumulator.
17. Adjust the pressure on hydraulic systems.
18. Change filters in hydraulic systems.
19. Change hydraulic fluid.
20. Install hydraulic pressure regulator.
21. Check and replace hydraulic pressure regulator.
22. Install hydraulic sequence valve.
23. Check and replace hydraulic sequence valve.
24. Install counter-balance valve.
25. Install flow control or speed control valve.
26. Install hydraulic pump.
27. Replace hydraulic cylinder.

Fundamentals of Machine Tools – A (For Maintenance) 470313

This course provides the basic principles needed for a solid foundation in machine tool technology. Areas and machines covered include shop safety, bench work, drill press, power saw, measurement, mills, and lathes.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate and practice safe work habits in the lab area as outlined in NIMS Framework for Machining Skills.
5. Perform bench work processes, hacksaw, files, layout, drill, tap and other activities to meet industry standards.
6. Perform safe and functional activities on the following machines: horizontal band saw, vertical band saw, drill press, arbor press, lathes, and mills.
7. Perform tasks with cutting hand tools and non-cutting hand tools.
8. Identify and explain the handling procedure for hazardous material and the content of MSDS (Material Safety Data Sheet).
9. Identify safety needs and regulations in a machine shop.
10. Identify non-cutting hand tools and the proper use of them.
11. Prepare for a bench work process.
12. Hand saw with a hacksaw.
13. Bench file the workpiece.
14. Dress and true grinding wheels on bench and pedestal grinders.
15. Demonstrate knowledge of power saws, parts, and applications.
16. Demonstrate the care and safe use of the power saw.
17. Cut and weld band saw blades.
18. Perform operations on the cut-off saw.
19. Perform operations on the vertical band saw.
20. Demonstrate knowledge of drill press, parts, and applications.
21. Demonstrate the care and safe use of the drill press.
22. Calculate and set the cutting speed and feed on the drill press.
23. Sharpen drills.
24. Set up a drill press and drill holes.
25. Shape and finish holes on a drill press.
26. Tap holes by hand and machine on a drill press.
27. Thread by hand with taps and dies.
28. Operate an arbor press.
29. Use chisels and punches.
30. Demonstrate knowledge of hazardous materials handling.

31. Demonstrate knowledge of hazardous materials storage.
32. Demonstrate lock-out/tag-out procedures.
33. Demonstrate use of MSDS (Material Safety Data Sheet).
34. Measure with basic hand-held measuring instruments.

Fundamentals of Machine Tools – B (For Maintenance) 470314

This course provides the basic principles needed for a solid foundation in machine tool technology. Areas and machines covered include shop safety, bench work, drill press, power saw, measurement, mills, and lathes.

Prerequisite: Fundamentals of Machine Tools – A (For Maintenance) 470313

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Demonstrate and practice safe work habits in the lab area.
5. Demonstrate knowledge of lathes, parts, and applications.
6. Demonstrate the care and safe use of lathes.
7. Demonstrate use and knowledge of mill parts and applications.
8. Demonstrate knowledge of cutting tools.
9. Demonstrate knowledge of cutting fluids.
10. Identify and explain the handling procedure for hazardous material and the content of MSDS (Material Safety Data Sheet).
11. Calculate and set speeds and feeds on a lathe.
12. Sharpen high speed tool bits.
13. Mount workpiece on a lathe.
14. Face a workpiece.
15. Perform turning operations.
16. Machine with carbide cutting tools.
17. File and polish a workpiece.
18. Demonstrate knowledge of a milling machine, parts, and applications.
19. Demonstrate the care and safe use of milling machines.
20. Calculate and set speeds and feeds on the milling machine.
21. Mill flat surfaces and grooves using a vertical mill.
22. Apply cutting fluid to machining operations.

Gas Metal Arc Welding 470367

This course covers identification, inspection, and maintenance of GMAW machines; identification, selection and storage of GMAW electrodes; principles of GMAW; and the effects of variables on the GMAW process. Theory and applications of related processes such as FCAW and SMAW and metallurgy are also included. Students learn the practical application and manipulative skills of Gas Metal Arc Welding and the proper safety situations needed in this process. Both ferrous and non-ferrous metals will be covered, as well as various joint designs on plate in all positions.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Apply the technical math required for employment opportunities in welding.
5. Use lab equipment and tools.
6. Apply principles of GMAW to weld metals to include FCAW and SMAW.
7. Apply knowledge of the effects of variables of GMAW to weld plate and pipe.
8. Apply knowledge of basic metallurgy to control chemical, physical, and mechanical properties of alloy steels.
9. Identify and select filler materials for GMAW processes.
10. Weld fillet welds in all positions using various transfer modes on steel, stainless steel, and aluminum.

Heating and Humidification (for Industrial Maint.) 470363

This course explains heating systems from simple fossil fuel furnaces through more complex systems. This course will also concentrate on the line and control voltage circuitry pertaining to these systems. ARI (Air-Conditioning and Refrigeration Institute) Controls: Subtopics A-C; Heating Systems: Subtopics A-C; System Installation and Start-Up: Subtopics A and B; System Servicing and Troubleshooting: Subtopic C; Tools and Equipment: Subtopic D. This course is designed to develop the practical skills of troubleshooting, checking, adjusting, and installing heating units currently in use.

Prerequisite: HVAC Electricity (Ind Maint) 470365

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Adjust valves.
5. Check coil resistance of a valve coil.
6. Test gas valve operation.
7. Check the voltage at gas valve operator.
8. Check pressure at inlet vs. outlet of gas valve.
9. Perform a regular conversion on a gas valve from natural gas to LP or reverse: low, line voltage, redundant, two-stage, and modulating.
10. Explain the operation of a solenoid valve.
11. Explain direct vs. servo regulation.
12. Identify limited, non-adjustable and adjustable regulators.
13. Determine application of gas valves.
14. Differentiate between pilot proving devices.
15. Explain the operation of flame rod, mercury flame switch, bimetal, and millivolt flame sensors.
16. Test and change a thermocouple flame sensor.
17. Test spark ignition modules.
18. Perform safety lockout procedures for burners.
19. Measure resistance of a cad cell during operation.
20. Explain the operation of an oil delay valve.
21. Identify and install residential heating and cooling thermostats.
22. Test a fan/limit control to identify a set point of control.
23. Wire a complete heating system—line and low voltage.
24. Identify controls for heating and cooling.
25. Wire a humidistat into electrical circuit.
26. Wire control circuit for electronic air cleaner.

27. Test and adjust the fuel system of furnace.
28. Check the ignition system.
29. De-rate or change over a gas burner.
30. Adjust burner system to recommended efficiency.
31. Check for proper temperature rise across the furnace.
32. Test all safety controls.
33. Set proper air distribution in house.
34. Remove, install, and adjust blower motor and/or belt.
35. Clean the pilot assembly.
36. Adjust the regulator.
37. Observe proper draft conditions.
38. Oil motor(s) and bearings.
39. Check and adjust the heat anticipator.
40. Check circulator for alignment and lubrication.
41. Set aquastat.
42. Check water-regulating valve operator.
43. Inspect/change zone valve operator.
44. Remove air from water system.
45. Wire a multi-zone/multi-pump hydronic system.
46. Identify types of hydronic piping systems.
47. Test boiler efficiency and clean if necessary.
48. Oil motor(s).
49. Check and adjust the heat anticipator.
50. Perform pressure checks on the fuel system.
51. Perform pressure checks on the venting system.
52. Measure temperature difference across heating and cooling equipment.
53. Adjust individual register outlets to properly balance system.
54. Describe the reasons for codes.
55. Discuss three model codes: boca, standard, uniform.
56. Identify the codes and standards for the applicable area, locality, or state.
57. Discuss the relationship between codes and manufacturers' installation instructions.
58. Identify standards not covered by codes: ARI (Air-Conditioning and Refrigeration Institute), ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers), and SMACNA (Sheet Metal and Air Conditioning Contractors National Association).
59. Demonstrate good customer relations in a classroom situation.
60. Explain the importance of manufacturers' installation and operation requirements.
61. Determine equipment electrical requirements.
62. Verify equipment air flow and distribution requirements.
63. Check operation of all electrical control components.
64. Check operation of gas train components and measurements.
65. Demonstrate use of tools and instruments.
66. Check oil burner components and measurements.
67. Check ignition systems while following all safety principles.
68. Evaluate fuel supply systems.
69. Test for proper combustion.

70. Check electrical components for operation and wiring connections.
71. Check for correct heating input and adjust to manufacturers' specifications.
72. Read and demonstrate an understanding of electrical wiring diagrams.
73. Use tools and test equipment appropriately while following safety practices.
74. Demonstrate an understanding of combustion theory.
75. Determine air requirements.
76. Develop a systematic way to diagnose system problems and demonstrate in class.
77. Determine cause of failure in a heating system.
78. Identify and describe all possible causes of failure and how to eliminate causes.
79. Verify system operation.
80. Write a service report.
81. Measure chimney draft with a draft gauge.
82. Perform an efficiency test on an oil-gas burner: smoke test, CO2 test, and 02 test.
83. Determine the efficiency of an oil pump using a vacuum gauge and a pressure gauge.
84. Determine the relative humidity using a sling psychrometer.
85. Measure gas pressure with a U-tube manometer.

HVAC Electricity (Ind Maint) 470365

This course introduces students to the basic physics of electricity. Students apply Ohm's Law; measure resistance, voltage, ohms, watts and amps; construct various types of electrical circuits; select wire and fuse sizes; and learn to troubleshoot an electric motor and motor controls.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Measure ohms with an ohmmeter.
5. Measure voltage with a voltmeter.
6. Measure amps with an ammeter.
7. Measure watts with a wattmeter.
8. Solve electrical circuit problems using Ohm's Law.
9. Draw and interpret electrical symbols.
10. Construct series circuits.
11. Construct parallel circuits.
12. Construct series-parallel circuits.
13. Connect, operate, and identify the types of single-phase motors.
14. Measure the resistance of windings in a split-phase motor and identify the start/run windings.
15. Test capacitors.
16. Select wire and fuse sizes.
17. Test transformers.
18. Locate faults in electrical circuits.
19. Identify types of 3-phase power supplies.
20. Troubleshoot magnetic motor starters and coils.

Industrial Maintenance Electrical Motor Controls 470348

This course addresses the diversity of electrical motor control devices and applications used in industry today with safety and electrical lockouts included.

Prerequisite: Industrial Maintenance Electrical Principles 470322

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Connect control relay systems.
5. Connect a dynamic breaking circuit for AC motors.
6. Test magnetic starters.
7. Connect overload relays into starting control circuits.
8. Connect reduced voltage starters.
9. Connect time delay relays.
10. Connect motor for automatic controls.
11. Connect automatic reduced voltage starter for DC motor control.
12. Connect limit switches.
13. Connect motor control circuits for plug-ins.
14. Connect point starters for DC motors.
15. Connect push button stations.
16. Connect selector switches.
17. Connect sensing devices (non-electric).
18. Connect magnetic starters.

Industrial Maintenance Electrical Principles 470322

This course introduces the theory of electricity and magnetism and the relationship of voltage, current, resistance, and power in electrical circuits. The course is designed to develop an understanding of alternating and direct current fundamentals. Students will apply formulas to analyze the operation of AC and DC circuits.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Review and apply OSHA Standards and National Electrical Code.
5. Care for, maintain, identify and use basic hand tools.
6. Solder/de-solder electrical connections.
7. Set up and operate power supplies.
8. Compute, measure, and identify conductance and resistance of conductors and insulators.
9. Measure properties of a circuit using VOM and DMM meters.
10. Solve electrical circuit problems using Ohm's Law.
11. Analyze, construct and troubleshoot parallel circuits.
12. Analyze, construct and troubleshoot series circuits.
13. Analyze, construct and troubleshoot series-parallel circuits.
14. Determine physical and electrical characteristics of capacitors and inductors.
15. Analyze basic motors, generator theory and operation.
16. Write technical reports.
17. Use an oscilloscope to verify properties of an AC signal.
18. Determine physical and electrical characteristics of transformers and test procedures.
19. Compute and measure power in AC circuits.
20. Apply and demonstrate the Edison system and the three phase system.
21. Analyze and identify circuit protection.
22. Connect various transformer configurations.
23. Wire two- and three-way switches.
24. Wire single phase circuit.
25. Identify, install, and label circuit breakers, fuses and other overload protection in distribution panels.
26. Identify appropriate wiring sizes and amperage ratings.
27. Identify and install appropriate wiring techniques.
28. Install conductors in various forms of conduit raceways.

Industrial Maintenance of PLC's 470330

This course includes the theory of Programmable Logic Controllers to include installation, programming, interfacing, and troubleshooting PLC's.

Prerequisite: Industrial Maintenance Electrical Motor Controls 470348

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Describe basic operation of programmable controllers.
5. Apply language functions and symbols used in PLC.
6. Translate relay logic to PLC logic.
7. Fabricate I/O configurations using serial and parallel.
8. Design simple programmable controller applications.
9. Program PLC's.
10. Install PLC's to replace relay systems.
11. Install PLC's to operate fluid power systems.
12. Plan a shutdown procedure for PLC-managed equipment.
13. Troubleshoot hardware faults using PLC's.
14. Identify PLC hardware.
15. Program the use of timers, counters, and sequencers in PLC applications.
16. Develop basic PLC wiring diagrams and ladder logic programs.
17. Troubleshoot PLC applications.

Internship (Ind Maint) 470308

The internship provides supervised on-the-job work experience related to the students educational objectives. Students participating in the internship do not receive compensation.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1 - 3

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Gain career awareness and the opportunity to test career choices.
5. Receive work experience related to career interests prior to graduation.
6. Integrate classroom studies with work experience.
7. Receive exposure to facilities and equipment unavailable in a classroom setting.
8. Increase employability potential after graduation.

Maintaining Industrial Equipment 470318

This course is designed to introduce the student to maintenance techniques and procedures used to maintain industrial equipment.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Describe the care and safe use of maintenance tools, equipment and components, such as lock-out/tag-out, rigging, electrical safety.
5. Describe lubrication techniques used on machines and components.
6. Identify various types of bearings and seals.
7. Explain the replacement procedure for bearings and seals.
8. Explain alignment of couplings using straight edge and feeler gauge, dial indicator methods, and laser.
9. Explain the mounting and operation of centrifugal pumps and motors.
10. Explain the mounting and operation of speed reduction/speed increase assemblies.
11. Explain the mounting and operation of clutch and brake assemblies.
12. Identify common belts, such as V-Belt and timing.
13. Explain the tensioning and alignment of various belts.
14. Identify common types of chains, such as roller and silent.
15. Explain the tensioning and alignment of various chains.
16. Explain the alignment of sprockets and sheaves.
17. Explain the installation and adjustment variable of pitch sheaves.
18. Explain the common types of gears, such as spur and helical.
19. Describe the maintenance of open and closed gearing.
20. Explain the diametral pitch and gear meshing.
21. Explain vibration analysis in troubleshooting.
22. Identify various fasteners, key and keyways, and bolts.
23. Explain set-up, lighting and using oxyfuel cutting equipment.
24. Perform lubrication techniques on machines and components.
25. Replace bearings and seals.
26. Align couplings using straight edge and feeler gauge, dial indicator methods, and laser.
27. Mount and operate centrifugal pumps and motors.
28. Mount and operate speed reduction/speed increase assemblies.
29. Mount and operate clutch and brake assemblies.
30. Adjust tension and alignment of various belts.
31. Adjust tension and alignment of various chains.
32. Align sprockets and sheaves.
33. Install and adjust pitch sheaves.

34. Maintain open and closed gearing.
35. Use vibration analysis in troubleshooting.
36. Perform straight line, piercing, beveling with oxyfuel cutting equipment.

Refrigeration Fundamentals (For Maintenance) 470349

The student is introduced to the fundamentals of refrigeration, refrigeration terms, and the basic refrigeration cycle. Proper use of tools, test equipment, and materials is stressed. Environmental issues including refrigerant handling are discussed. Refrigerant piping and methods used to join them are taught. General and specific safety is emphasized.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Explain the history of refrigeration.
5. Compare the benefits of closed vs. open system.
6. Identify and explain the operation of the four major components.
7. Identify the high and low sides of the system.
8. Define matter and heat.
9. Distinguish between the three states of matter.
10. Explain the direction and rate of heat flow.
11. Describe the three methods of heat transfer.
12. Identify the reference points of temperature: boiling point, freezing point, critical temperature, and absolute zero.
13. Explain the difference between heat and temperature.
14. Explain the differences between latent and sensible heat.
15. Explain the relationship of pressures and fluids at different temperatures.
16. Calculate absolute and gauge pressures.
17. Measure absolute and gauge pressures.
18. Explain how fluids react in a closed vs. open system.
19. Compare temperature with pressure (P/T Chart).
20. Explain why fluids flow.
21. Define the properties of refrigerants.
22. Explain the uses of different refrigerants.
23. Identify color coding of refrigerant cylinders.
24. Explain classifications of refrigerants.
25. List proper transfer and storage of refrigerants.
26. Explain the four parts of the refrigeration cycle.
27. Draw a refrigeration system on a Pressure-Enthalpy (PH) chart.
28. Explain the benefits of superheat and subcooling.
29. Identify the effects of improper refrigerant in a system.
30. Identify basic tools and accessories: various screwdrivers, nutdrivers, socket wrenches, Allen (hex) wrenches, open- and box-end wrenches, and flare wrenches.

31. Identify power tools: general-purpose drill, power screwdriver, hammer drill, reciprocating saw, and screw-gun.
32. Identify fasteners: bolts, screws, masonry anchors, various electrical connectors, conduit, pipe and cable clamps, and nails.
33. Identify pipe and tubing tools: pipe cutters, reamers and threaders, tubing cutters and reamers, benders, flaring tools, swaging tools, and pipe vises.
34. Describe lubrication methods utilizing: grease guns, oilers, and sprays.
35. Measure pressures with the refrigeration gauge manifold.
36. Evacuate systems with a two-stage vacuum pump.
37. Measure vacuums with a thermistor vacuum gauge.
38. Measure temperatures with various thermometers.
39. Charge a system with an electronic charging scale.
40. Check for leaks with electronic leak detector dye and electrosonic.
41. Identify types of pipe and tubing used in refrigeration work.
42. Identify various types of fittings.
43. Describe methods of insulating pipe and tubing.
44. Identify soldering and brazing alloys used in HVACR.
45. Explain applications of soldering and brazing alloys.
46. Flare, swag, and bend copper tubing.
47. Identify types of torches.
48. Solder and braze copper tubing.
49. Cut and thread iron pipe.
50. Describe heat sink methods.
51. Describe heat exchange techniques.
52. Explain saturation temperature.
53. Determine the METD (Mean Effective Temperature Difference).
54. Check for and repair refrigerant leaks.
55. Measure temperatures with bimetal and glass stem thermometers.
56. Describe the applications of vibration eliminators.
57. Identify types of evaporators: bare-tube, finned, plate, unit coolers, and chillers.
58. Explain the operation performance of a condenser.
59. Charge system with refrigerant on liquid side as well as suction side.
60. Test and adjust all operating and safety controls.
61. Replace filter driers.
62. Inspect electrical circuit for defective connections.
63. Repair defective connections.
64. Interpret wiring diagram.
65. Clean drain line.
66. Check all electrical components for voltage and current.
67. Check and/or change compressor oil.
68. Clean condenser coil surface—air cooled and water cooled.
69. Perform all aspects of preventive maintenance.

Robotics and Automation (For Maintenance) 470351

This course provides an introduction to the theory of robots including terminology, components, and basic programming. It provides theory of servo and non-servo robots. Topics include robot types, controllers, manipulators, basic robotic programming, and fluid power systems. It also provides basic theory of flexible and computer-integrated manufacturing and control systems.

Prerequisite: Industrial Maintenance Electrical Motor Controls 470348

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Explain the set-up, repair, and maintenance of automatic machines.
5. Explain the set-up, repair, and maintenance of processing equipment.
6. Explain the set-up, repair, and maintenance of robots that work together as part of a total automated manufacturing system.
7. Develop cost/benefit analysis for automation.
8. Develop case studies for improving production, efficiency, and profitability.
9. Analyze, summarize, and interpret major factors in automation to include operator training, teamwork, resistance, and organized labor.
10. Analyze and develop safety strategies for automated systems.
11. Develop on-line and off-line robot programs.
12. Describe components in the integrated manufacturing environment.
13. Demonstrate knowledge of robot terminology.
14. Read and understand technical manuals.
15. Explain how to perform preventive maintenance.
16. Identify and describe the functions of vision systems.
17. Describe open-loop and closed-loop control.
18. Demonstrate knowledge of servo and non-servo systems.
19. Demonstrate knowledge of robot classifications.
20. Define computer-integrated manufacturing (CIM) systems.
21. Develop a safety strategy for automated work cells to include risk assessment and risk reduction.
22. Demonstrate leadership skills.

Shielded Metal Arc Welding (For Maintenance) 470354

This course presents students with the identification, inspection, and maintenance of SMAW electrodes, principles of SMAW, and effects of variables on the SMAW process to weld plate and pipe, and metallurgy.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Identify, select, and store SMAW electrodes.
5. Apply principles of SMAW process to cut and weld metals.
6. Apply the knowledge of the effects of variables on the SMAW process to weld plate and pipe.
7. Apply the knowledge of basic metallurgy to control chemical, physical, and mechanical properties of carbon steel.
8. Use shop equipment and tools.

Shop Management 470301

This course introduces the basic principles of safe and efficient shop management. Inventory control, fiscal management, and customer relations are emphasized.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Maintain tools and equipment.
5. Develop customer relations skills.
6. Prepare work orders.
7. Maintain inventory.
8. Maintain service records.
9. Supervise personnel.
10. Prepare parts requisition.
11. Provide fiscal management.
12. Complete an incident report.

Special Topics—Industrial Maintenance Technology 470336

Special Topics is designed to enhance a student's understanding of problem solving in industrial situations. It expands on the task lists that have already been taught to the student in previous industrial maintenance courses. This course does not count toward preparatory status.

Prerequisite: Consent of Instructor

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Complete selected tasks/problems as determined by instructor.

Welding for Maintenance 470328

This course will provide basic instruction needed for students to weld using SMAW, MIG, TIG and Oxy-Fuel.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in maintenance.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Describe the selection, care, and storage of oxy-fuel cutting equipment.
5. Explain the identification, selection, and storage of SMAW electrodes.
6. Apply principles of SMAW process to cutting welding metals.
7. Describe the set up and use of SMAW welders.
8. Explain the application of basic metallurgy principles to control chemical, physical, and mechanical properties of carbon steel.
9. Explain the proper use of shop equipment and tools.
10. Explain the set up and use of MIG welders.
11. Explain the set up and use of TIG welders.

METAL FABRICATION CAREER PATHWAYS

Manufacturing TRACK CIP 48.0500.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from the partnering technical center's manufacturing course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to TRACK website.

Sheet Metal Technician CIP 48.0506.01

Sheet metal technicians create parts to the specifications required through line development and fabrication. Sheet metal is measured and sheet metal patterns are cut and formed for the determined available space. Sheet metal technicians must have strong math skills for the development of geometrical parts. The Sheet Metal Technician provides direct support to manufacturing for the design, fabrication, modification, and evaluation of parts, assemblies, components and sub-assemblies according to specifications.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 480816 Metal Trade Information and Metals (.5 credit)
- 480813 Parallel Line Layout
- 480817 Sheet Metal I – A
- 480818 Sheet Metal I – B
- 480803 Co-op I (Metal Fab) **OR** 480806 Internship (Metal Fab)

METAL FABRICATION COURSES

Co-op I (Metal Fab) 480803

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Co-op II (Metal Fab) 480804

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 2

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Co-op III (Metal Fab) 480805

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 3

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Internship (Metal Fab) 480806

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the internship do not receive compensation.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1 - 3

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Metal Trade Information and Metals 480816

A series of lectures and demonstrations of hand tools, use of machinery in the shop, and various types of metal and their uses in the metal trade will be discussed.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Apply work site and lab safety procedures.
2. Apply personal safety rules and procedures.
3. Apply fire prevention rules and procedures.
4. Demonstrate hazardous communication procedures.
5. Describe and demonstrate universal precaution procedures.
6. Identify common sheet metal fabrication hand tools.
7. Demonstrate proper use of common sheet metal fabrication hand tools.
8. Obtain First Aid certification.
9. Obtain CPR certification.
10. Use and care for tools and equipment.
11. Select appropriate sheet metal gauges.
12. Select specified types of sheet metals.

Parallel Line Layout 480813

This course introduces the parallel line method of developing the pattern for an object. In addition, this course presents basic applied math, lines, multi-view drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, and sketching typical to sheet metal drawings. Safety will be emphasized as an integral part of the course.

Prerequisite: Metal Trade Information and Metals 480816

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Identify the purposes for parallel line layout.
2. Identify parts fabricated with parallel line layout methods.
3. Use the parallel line method to lay out sheet metal patterns.
4. Identify hand tools required for parallel line layout development.
5. Measure sheet metal to determine the available space for assembly pattern.
6. Select appropriate sheet metal gauge.
7. Form sheet metal assemblies with bench stakes and mallets.
8. Introduction and math review (fractions and decimals).
9. Identify line types used in combinations.
10. Identify multiple views.
11. Arrange multiple views.
12. Demonstrate visualizing techniques of multiple views.
13. Identify one-view drawing.
14. Arrange and identify auxiliary views.
15. Demonstrate the use of size and location dimensions.
16. Identify standard listings on working drawings.
17. Size dimensions of holes and angles.
18. Locate dimensions for centering of holes, points, and centers.
19. Identify half, full, and removed sections.
20. Identify usages for chamfers and interpret sizes.
21. Sketch oblique views of various parts.
22. Sketch and dimension shop drawings.

Radial Line Development 480814

Radial line development uses many of the procedures of parallel line development and triangulation. The student will learn to develop patterns from any centered, round or square taper, using the radial line method.

Prerequisite: Parallel Line Layout 480813

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply safety rules and procedures.
2. Use and care for tools and equipment.
3. Interpret building trades blueprints.
4. Measure sheet metal to determine the available space for assembly pattern.
5. Use the radial line method to lay out sheet metal patterns.
6. Select sheet metal gauges for patterns.
7. Cut sheet metal with aviation snips.
8. Cut sheet metal with straight snips.
9. Fabricate residential and commercial heating and air conditioning duct work.

Sheet Metal I – A 480817

This course introduces the student to interpreting drawings of plans for a duct system and also learning how to fabricate the ducts.

Prerequisite: Parallel Line Layout 480813

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Measure sheet metal to determine available space for assembly patterns.
2. Use the radial line method to lay out sheet metal patterns.
3. Use the triangular method to lay out sheet metal patterns.
4. Use the parallel line method to lay out sheet metal patterns.
5. Select sheet metal gauges for patterns.
6. Select types of sheet metals.
7. Cut sheet metal layouts with aviation snips.
8. Cut sheet metal layouts with bulldog snips.
9. Cut sheet metal layouts with circular snips.
10. Cut sheet metal layouts with combination snips.
11. Cut sheet metal layouts with double-cut snips.
12. Cut sheet metal layouts with straight snips.
13. Store tools.
14. Cut sheet metal with hand notchers.
15. Cut sheet metal with combination notchers.
16. Cut sheet metal with squaring shears.
17. Cut sheet metal with universal metal cutters.
18. Bend sheet metal with hand seamers.
19. Form sheet metal assemblies with blow horn stakes and mallets.
20. Form sheet metal assemblies with conductor stakes and mallets.
21. Form sheet metal assemblies with common squares and mallets.
22. Form sheet metal assemblies with creasing stakes and mallets.
23. Form sheet metal with the slip-roll to create cylindrical shape.
24. Form single and double hems on sheet metal layouts with brake.
25. Turn edges of sheet metal elbow assemblies with an elbow edging machine.
26. Form sheet metal assemblies with hollow mandrel stakes and mallets.
27. Form sheet metal assemblies with mandrel stakes and mallets.
28. Form sheet metal assemblies with needle case stakes and mallets.
29. Fabricate residential and commercial heating and air conditioning duct work.
30. Cut sheet metal layouts with do-all saws.
31. Cut sheet metal layouts with hacksaws.

Sheet Metal I – B 480818

This course provides advanced training in designing and interpreting plans for a duct system and advanced fabrication of duct systems and precision sheet metal concepts.

Prerequisite: Sheet Metal I – A 480817

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Measure sheet metal to determine available space for assembly patterns.
2. Use the radial line method to lay out sheet metal patterns.
3. Use the triangular method to lay out sheet metal patterns.
4. Use the parallel line method to lay out sheet metal patterns.
5. Select sheet metal gauges for patterns.
6. Select types of sheet metals.
7. Cut sheet metal layouts with aviation snips.
8. Cut sheet metal layouts with bulldog snips.
9. Cut sheet metal layouts with circular snips.
10. Cut sheet metal layouts with combination snips.
11. Cut sheet metal layouts with double-cut snips.
12. Cut sheet metal layouts with straight snips.
13. Store tools.
14. Make advanced sheet metal cuts with hand notchers.
15. Make advanced sheet metal cuts with combination notchers.
16. Make advanced sheet metal cuts with squaring shears.
17. Make advanced sheet metal cuts with universal metal cutters.
18. Make advanced sheet metal bends with hand seamers.
19. Form sheet metal assemblies with blow horn stakes and mallets.
20. Form sheet metal assemblies with conductor stakes and mallets.
21. Form sheet metal assemblies with common squares and mallets.
22. Form sheet metal assemblies with creasing stakes and mallets.
23. Form sheet metal with the slip-roll to create cylindrical shape.
24. Form single and double hems on sheet metal layouts with brake.
25. Make advanced sheet metal turned edges or elbow assemblies with an elbow edging machine.
26. Form advanced sheet metal assemblies with hollow mandrel stakes and mallets.
27. Form advanced sheet metal assemblies with mandrel stakes and mallets.
28. Form advanced sheet metal assemblies with needle case stakes and mallets.
29. Fabricate advanced residential and commercial heating and air conditioning duct work.
30. Glue insulation to the exterior and interior surfaces.
31. Install heating, ventilation, and air conditioning ducts.
32. Cut advanced sheet metal layouts with do-all saws.
33. Cut advanced sheet metal layouts with hacksaws.

34. Cut advanced sheet metal layouts with hawk-billed snips.
35. Identify capacities for the English Wheel.
36. Shape sheet metal parts with the English Wheel.
37. Smooth sheet metal parts with the English Wheel.
38. Shape sheet metal parts with the Shot Bag and Mallet.

Sheet Metal II – A 480819

This course provides a series of lectures to improve skills in pattern development and fabrication of more difficult fittings.

Prerequisite: Sheet Metal I – B 480818

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply safety rules and procedures.
2. Use and care for tools and equipment.
3. Interpret building trade blueprints.
4. Draw sheet metal assemblies.
5. Use the radial line method to lay out sheet metal patterns.
6. Use the triangular method to lay out sheet metal patterns.
7. Use the parallel line method to lay out sheet metal patterns.
8. Select sheet metal gauges for patterns.
9. Cut sheet metal with aviation snips.
10. Cut sheet metal with straight snips.
11. Cut sheet metal with squaring shears.
12. Turn edges of sheet metal elbow assemblies with an elbow turning machine.
13. Fabricate residential and commercial heating and air conditioning duct work.
14. Install heating, ventilation, and air conditioning ducts.
15. Install machine guards and assemblies.
16. Use signed numbers.
17. Apply algebraic symbols and terms.
18. Solve simple equations.
19. Solve problems in work-related situations and distinguish between direct and indirect relationships.
20. Perform and apply surface measurement calculations.
21. Use exponents and radicals.

Sheet Metal II – B 480820

This course provides a series of advanced lectures to improve skills in advanced pattern development and fabrication of complicated fittings.

Prerequisite: Sheet Metal II – A 480819

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply safety rules and procedures.
2. Use and care for tools and equipment.
3. Interpret building trade blueprints.
4. Draw advanced sheet metal assemblies.
5. Use the radial line method to lay out advanced sheet metal patterns.
6. Use the triangular method to lay out advanced sheet metal patterns.
7. Use the parallel line method to lay out advanced sheet metal patterns.
8. Select sheet metal gauges for patterns.
9. Cut sheet metal with aviation snips.
10. Cut sheet metal with straight snips.
11. Cut sheet metal with squaring shears.
12. Turn complicated edges of sheet metal elbow assemblies with an elbow turning machine.
13. Fabricate complicated residential and commercial heating and air conditioning duct work.
14. Install heating, ventilation, and air conditioning ducts.
15. Install machine guards and assemblies.
16. Cut sheet metal parts on the power shear.
17. Use mechanical and computerized shear gauges.
18. Cut sheet metal products on the band saw.
19. Use die applications on the power brake.
20. Perform alignment and die setting of power brake.
21. Be introduced to MIG welding.
22. Use CNC Controlled Punch Press.
23. Program CNC Controlled Punch Press.

Special Projects I (Metal Fab) 480879

This is a course designed for the student who has demonstrated specific special needs. This course does not count toward preparatory status.

Prerequisite: Radial Line Development 480814

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Apply work site and lab safety procedures.
2. Describe and apply the problem-solving processes independently or in teams to sheet metal fabrication projects.

WELDING TECHNOLOGY CAREER PATHWAYS

Manufacturing TRACK CIP 48.0500.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of (4) core courses chosen from the partnering technical center's manufacturing course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to TRACK website.

Skilled Trades Welding TRACK CIP 48.0508.99

The Welding TRACK is designed as a pre-apprenticeship pathway for students to enter Registered Apprenticeship training programs. Students must successfully complete the four course sequence and the eight safety modules. In addition, each student must pass the Kentucky Department of Transportation (KY DOT) written exam and the KY DOT 3G performance exam OR AWS 2F exam OR AWS Sense exam. Upon completion the student will receive a pre-apprenticeship industry certification issued by the Kentucky Labor Cabinet. This certification will be recognized by participating partners for an interview and possible credit upon acceptance. Credit is at the discretion of the training organization. For more information or a list of participating organizations, please refer to TRACK website.

BEST PRACTICE COURSES

Complete (4) four required credits.

- 480522 Gas Metal Arc Welding (GMAW)
- 480521 Shielded Metal Arc Welding (SMAW)
- 480528 SMAW Groove Welds with Backing Lab
- 480535 SMAW Open Groove Lab

Additional coursework to ENHANCE pathway:

- 480525 Gas Tungsten Arc Welding (.5 – 1 credit)
- 480530 GTAW Groove Lab
- 480538 Gas Tungsten Arc Welding Pipe Lab A
- 480595 Special Problems (Welding)

Welder-Entry Level CIP 48.0508.01

An entry level welder demonstrates the ability to assist lead welders in the fabrication of steel and metal structures. Students must be adept at performing basic welding functions and calculating dimensions as well as operating power equipment, grinders and other related tools. Student must be proficient in reading and interpreting basic blueprints and following work procedure specifications (WPS).

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 480505 Blueprint Reading for Welding (.5 – 1 credit) **OR** 499920 Basic Blueprint Reading (.5 credit) **AND** 480524 Basic Welding (.5 – 1 credit)
- 480523 Oxy-fuel Systems (.5 – 1 credit) **OR** 480501 Cutting Processes (.5 – 1 credit)
- 480521 Shielded Metal Arc Welding (SMAW)
- 480522 Gas Metal Arc Welding (.5 – 1 credit)
- 480533 GMAW Groove Lab
- 480528 SMAW Groove Welds with Backing Lab
- 480535 SMAW Open Groove Lab
- 480525 Gas Tungsten Arc Welding (.5 – 1 credit)
- 480538 Gas Tungsten Pipe Welding Pipe Lab A
- 480530 GTAW Groove Lab
- 480540 GMAW Pipe Lab A
- 480534 GMAW Aluminum Lab (.5 credit)
- 480536 Shielded Metal Arc Welding Pipe Lab A
- 480541 Co-op I (Welding) **OR** 480544 Internship (Welding)

WELDING TECHNOLOGY COURSES

Basic Blueprint Reading 499920

This course presents basic applied math, lines, multi-view drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, threads and fasteners, and sketching typical to all shop drawings. Safety will be emphasized as an integral part of the course.

Recommended Grade Level: 9 - 12

Recommended Credit: .5

Students will:

1. Study an introduction and math review including fractions and decimals.
2. Identify the alphabet of lines.
3. Identify multiple views.
4. Arrange multiple views.
5. Arrange two-view drawings.
6. Identify one-view drawings.
7. Arrange and identify auxiliary views.
8. Demonstrate the use of size and location dimensions.
9. Demonstrate proper dimensions of cylinders and arcs.
10. Size dimensions of holes and angles.
11. Locate dimensions for centering of holes, points, and centers.
12. Interpret the base line dimensions on drawings.
13. Identify half, full, and removed sections.
14. Identify electrical schematic and diagram symbols.
15. Identify welding symbols and equipment.
16. Interpret ordinate and tabular dimensions.
17. Set tolerances using geometric dimensioning techniques.
18. Sketch parts with irregular shapes.
19. Sketch oblique views of various parts.
20. Sketch and dimension shop drawings.
21. Dimension parts using shop notes.
22. Calculate tolerances.
23. Identify labeling of various screw threads.
24. Calculate tapers and machined surfaces.
25. Interpret connections and flow of various electrical, hydraulic, and pneumatic schematics and diagrams.

Basic Welding 480524

Students are introduced to welding, cutting processes, and related equipment. Basic setup, operation, and related safety are applied.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Set up and operate various welding and cutting equipment.

Blueprint Reading for Welding 480505

This course provides a study of occupationally specific prints for welders. Advanced study of multi-view drawings, assembly drawings, datum dimensions, numerical control drawings, sheet metal prints, castings and forgings, instrumentation and control charts, diagrams, working drawings, geometric dimensioning, tolerance, and use of reference materials and books are included. Occupational specifics including welding drawings, symbols, joint types, grooves, pipe welding symbols, testing symbols, and specification interpretations are stressed.

Prerequisite: Consent of Instructor

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Interpret lines.
5. Interpret views to include AWS and ISO symbols when needed.
6. Interpret conventional and datum line dimensions.
7. Interpret and apply tolerances.
8. Interpret section lines.
9. Interpret sectioning.
10. Interpret and apply American Welding Society welding symbols.
11. Interpret and apply International Standard welding symbols.
12. Draw shop sketches.
13. Interpret various types of prints to include fabrication, repair, structural steel, and piping prints.
14. Read and interpret blueprints.
15. Complete projects from prints.
16. Practice controlling distortion.
17. Practice repairing distortion.

Co-op I (Welding) 480541

Co-op provides supervised on-the-job work experience related to the educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Prerequisite: Consent of Instructor

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Gain career awareness and the opportunity to test career choices.
5. Receive work experience related to career interests prior to graduation.
6. Integrate classroom studies with work experience.
7. Receive exposure to facilities and equipment unavailable in a classroom setting.
8. Increase employability potential after graduation.
9. Earn funds to help finance education expenses.

Cutting Processes 480501

Students will obtain a working knowledge of various cutting processes used by the welding industry. Skills will include, but are not limited to: safety; theory of operation; setup and operating techniques; troubleshooting; making minor equipment repairs; terms and definitions; identification; evaluation; and repair and prevention of discontinuities of cut surfaces. Also included are oxy-fuel cutting, plasma arc cutting, exothermic cutting, air carbon arc cutting, shielded metal arc cutting, and mechanical cutting processes.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Practice cutting processes safety procedures.
5. Discuss the welding theories of operation.
6. Discuss setup and operating techniques.
7. Apply principles of troubleshooting and making minor equipment repairs.
8. Identify, evaluate, repair, and prevent reoccurrence of discontinuities of cut surfaces.

Gas Metal Arc Welding 480522

This course covers identification, inspection, and maintenance of GMAW machines; identification, selection and storage of GMAW electrodes; principles of GMAW; and the effects of variables on the GMAW process. Theory and applications of related processes such as FCAW, SMAW, and metallurgy are also included. Students learn the practical application and manipulative skills of Gas Metal Arc Welding and the proper safety situations needed in this process. Both ferrous and non-ferrous metals will be covered, as well as various joint designs on plate in all positions.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with integrity, responsibility, quality, discipline and teamwork.
4. Use lab equipment and tools.
5. Apply principles of GMAW to weld metals including FCAW and SMAW.
6. Apply knowledge of the effects of variables of GMAW to weld plate and pipe.
7. Apply knowledge of basic metallurgy to control chemical, physical, and mechanical properties of alloy steels.
8. Identify and select filler materials for GMAW processes.
9. Weld fillet welds in all positions using various transfer modes on steel, stainless steel, and aluminum.

Additional content optional for all pathways, but **must** be taught for students in Skilled Trades Welding TRACK CIP 48.0508.99

1. Interpret and apply tolerances.
2. Interpret and apply American Welding Society welding symbols.
3. Draw shop sketches.
4. Read and interpret blueprints.
5. Interpret lines.
6. Interpret views to include AWS (ISO symbols optional).
7. Interpret conventional and datum line dimensions.
8. Interpret and apply tolerances.
9. Interpret sectioning and section lines.
10. Apply principles of oxy-fuel systems to cut, weld, braze, and braze-weld with oxy-fuel.
11. Apply principles of controlling distortion.
12. Set up components of oxy-fuel equipment and setup procedures.
13. Apply oxy-fuel cutting applications and procedures.
14. Apply oxy-fuel welding applications and procedures.
15. Apply brazing and braze welding principles and applications.

Gas Tungsten Arc Welding 480525

This course covers identification, inspection, and maintenance of GTAW machines; identification, selection and storage of GTAW electrodes; principles of GTAW; effects of variables on the GTAW process; and metallurgy. This course also teaches the theory and application of Plasma Arc Cutting.

Recommended Grade Level: 10 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Use lab equipment and tools.
5. Apply principles of GTAW to weld metals.
6. Set up GTAW systems.
7. Apply knowledge of effects of variables to weld plate and pipe.
8. Apply knowledge of basic metallurgy to control chemical, physical, and mechanical characteristics of non-ferrous metals.
9. Identify and select GTAW electrodes.
10. Identify and select GTAW fill rods.
11. Clean metals with solvent or cleaning fluids.
12. Set up and operate plasma arc cutting equipment.

Gas Tungsten Arc Welding Pipe Lab A 480538

Students learn the method of operation and application of the Gas Tungsten Arc Welding system for welding of both ferrous and non-ferrous pipe in 2G and 5G positions.

Prerequisites: GTAW Groove Lab 480530 **OR** Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on Integrity, responsibility, quality, discipline and teamwork.
4. Weld pipe (GTAW).

GMAW Aluminum Lab 480534

Students learn to weld aluminum using GMAW process. Fillet and groove welds are made in all positions on both plate and pipe. Short circuiting and spray transfers are used where appropriate.

Prerequisites: Gas Metal Arc Welding 480522 **OR** Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Weld fillet and groove welds on aluminum plate in all positions using GMAW-S.
5. Weld fillet and groove welds on aluminum plate in all positions using spray transfer GMAW.
6. Weld fillet and groove welds on aluminum pipe in all positions.

GMAW Groove Lab 480533

Students learn the method of operation and application of the Gas Metal Arc Welding process for welding groove welds in both ferrous and non-ferrous plate in all positions using both short circuiting and spray transfer where appropriate.

Prerequisites: Gas Metal Arc Welding 480522 **OR** Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Weld groove welds on ferrous and non-ferrous plate in all positions with short circuiting and spray transfer where appropriate.

GMAW Pipe Lab A 480540

This course acquaints the student with the operation and application of the Gas Metal Arc System for welding pipe in 2G and 5G positions.

Prerequisite: GMAW Groove Lab 480533 **OR** Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Weld pipe in 2G and 5G (GMAW).

GTAW Groove Lab 480530

Students learn the method of operation and application of the Gas Tungsten Arc Welding process for welding groove welds in both ferrous and non-ferrous plate in all positions.

Prerequisite: Gas Tungsten Arc Welding 480525 **OR** Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Weld groove welds in ferrous and non-ferrous plate in all positions.

Internship (Welding) 480544

The internship provides supervised on-the-job work experience related to the students' education objectives. Students participating in the practicum do not receive compensation.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1 - 3

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Gain career awareness and the opportunity to test career choices.
5. Receive work experience related to career interests prior to graduation.
6. Integrate classroom studies with work experience.
7. Receive exposure to facilities and equipment unavailable in a classroom setting.
8. Increase employability potential after graduation.

Oxy-Fuel Systems 480523

This course provides a working knowledge of oxy-fuel identification, set up, inspection, and maintenance; consumable identification, selection and care; principles of operation; and effects of variables for manual and mechanized oxy-fuel cutting, welding, brazing principles and practice, and metallurgy. Shop safety and equipment use are also covered.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Practice oxy-fuel welding safety procedures.
5. Use shop equipment and tools.
6. Apply principles of oxy-fuel systems to cut, weld, braze, and braze-weld with oxy-fuel.
7. Apply principles of controlling distortion.
8. Set up components of oxy-fuel equipment and setup procedures.
9. Apply oxy-fuel cutting applications and procedures.
10. Apply oxy-fuel welding applications and procedures.
11. Apply brazing and braze welding principles and applications.

Shielded Metal Arc Welding (SMAW) 480521

Students learn the identification, inspection, and maintenance of SMAW electrodes; principles of SMAW; the effects of variables on the SMAW process to weld plate and pipe; and metallurgy.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with integrity, responsibility, quality, discipline and teamwork.
4. Identify, select, and store SMAW electrodes.
5. Apply principles of SMAW process to cut and weld metals.
6. Apply the knowledge of the effects of variables on the SMAW process to weld plate and pipe.
7. Apply the knowledge of basic metallurgy to control chemical, physical, and mechanical properties of carbon steel.
8. Use shop equipment and tools.

Additional content optional for all pathways, but **must** be taught for students in Skilled Trades Welding TRACK CIP 48.0508.99

1. Interpret and apply tolerances.
2. Interpret and apply American Welding Society welding symbols.
3. Draw shop sketches.
4. Read and interpret blueprints.
5. Interpret lines.
6. Interpret views to include AWS (ISO symbols optional).
7. Interpret conventional and datum line dimensions.
8. Interpret and apply tolerances.
9. Interpret sectioning and section lines.
10. Apply principles of oxy-fuel systems to cut, weld, braze, and braze-weld with oxy-fuel.
11. Apply principles of controlling distortion.
12. Set up components of oxy-fuel equipment and setup procedures.
13. Apply oxy-fuel cutting applications and procedures.
14. Apply oxy-fuel welding applications and procedures.
15. Apply brazing and braze welding principles and applications.

Shielded Metal Arc Welding Pipe Lab A 480536

Students will learn the required manipulative skills to arc weld pipe using mild steel electrodes in the 2G and 5G positions including proper pipe preparations, electrodes, safety precautions, and welding sequences. Fillet welds on pipe joints are also included in 2F, 2FR, 4F, and 5F positions.

Prerequisite: SMAW Open Groove Lab 480535

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Use lab equipment and tools.
5. Apply principles of SMAW.

Shielded Metal Arc Welding Pipe Lab B 480537

Students will learn the required manipulative skills to arc weld pipe using mild steel electrodes in the 6G position including proper pipe preparations, electrodes, safety precautions, and welding sequences.

Prerequisite: SMAW Open Groove Lab 480535

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Weld pipe (SMAW).

SMAW Groove Welds with Backing Lab 480528

Students will acquire the manipulative skills to do groove welds in all positions with backing.

Prerequisites: Shielded Metal Arc Welding (SMAW) 480521 **OR** Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Weld SMAW groove welds in all positions.

SMAW Open Groove Lab 480535

This course offers the student the opportunity to advance skills in the practical aspects of vee-butt plate welding using SMAW.

Prerequisites: Shielded Metal Arc Welding (SMAW) 480521 **OR** Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Apply principles of SMAW to welding.
5. Perform skills in vee-butt plate welding.

Special Problems (Welding) 480595

This is a course designed for the student who has demonstrated specific needs. This course does not count toward preparatory status.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Complete selected tasks/problems as determined by the instructor.

Welding Certification 480507

Students will gain a working knowledge of certification encountered in welding. The student will start with developing a WPS, qualify the WPS, and qualify personnel. Documents used in welding certification are developed and used. This course does not count toward preparatory status.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities in welding.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Apply destructive and non-destructive testing methods.
5. Apply knowledge of procedure qualification.
6. Apply knowledge of performance qualification.
7. Apply knowledge of welding codes.
8. Apply knowledge of welding standards.
9. Apply knowledge of welding specifications.

WOOD MANUFACTURING CAREER PATHWAYS

Manufacturing TRACK CIP 48.0500.99

The Tech Ready Apprentices for Careers in Kentucky (TRACK) Youth Apprenticeship program is a partnership between the Kentucky Department of Education's Office of Career and Technical Education and the Kentucky Labor Cabinet to provide secondary students with career pathway opportunities into employers who offer Registered Apprenticeship programs.

Employers are able to tailor the program for their specific needs and select the Career and Technical Education courses and students for their apprenticeship pathway. Employers benefit by gaining future employees that have a good foundation and an interest in that occupation. Additionally, it enables students to receive a nationally recognized credential.

Successful completion is determined by the employer. The student will be awarded an industry certification through the Kentucky Labor Cabinet. All co-op hours worked can be counted towards the Registered Apprenticeship.

BEST PRACTICE COURSES

Complete (4) four credits:

A minimum of four (4) courses chosen from the partnering technical center's manufacturing course offerings. These courses are chosen by the employer sponsoring the Registered Apprenticeship. The employer must provide a student co-op opportunity.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved in the TRACK program except for student employee wages. For more information, please refer to TRACK website.

Wood Manufacturing CIP 48.0703.02

Cabinet makers are specific types of woodworkers who create and install cabinets in bathrooms, kitchens, and other areas of homes or businesses. Typical duties of cabinet makers include designing custom cabinets, making cabinets, installing cabinetry, consulting with clients and other duties as needed. Cabinet makers are responsible for cutting and shaping wood, preparing surfaces and forming a completed product.

PLTW courses require an agreement between Project Lead the Way and the local school district.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 480719 Technical Drawing and Blueprint Reading (.5 credit)
- 480720 Wood Finishing (.5 credit)
- 480740 Wood Product Manufacturing
- 480731 Cabinet Making Technology
- 480733 Advanced Wood Processing
- 480725 CAD for Wood Technology (.5 credit)
- 480721 Furniture Technology
- 480110 Introduction to Computer-Aided Drafting
- 480716 Lumber Grading and Drying
- 480711 Introduction to Panel Processing
- 480733 Advanced Wood Processing
- 480717 Millwork Technology
- 480741 Co-op I (Wood) **OR** 480744 Internship (Wood)

WOOD MANUFACTURING COURSES

Advanced Wood Processing 480733

This course is a capstone experience for advanced wood processing technicians involving the integration of computer-aided design and world-class manufacturing of wood products.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Identify the basic parts of a CNC machining center.
5. Describe the career opportunities and job titles in CNC.
6. Identify the tasks that must be done to put a job into production.
7. Describe the tasks in the CNC process.
8. Identify standard and auxiliary axes on routers and boring machines using the "Right Hand Rule."
9. Describe the characteristics of and differences between position and reference points.
10. Calculate coordinate points using absolute Cartesian values.
11. Calculate coordinate points using incremental Cartesian values.
12. Locate and select coordinate values for reference points.
13. Identify data storage media in CNC.
14. Identify the components of a CNC system.
15. List the special features of CNC.
16. Select the tooling for a CNC job.
17. Select and use appropriate holding tools.
18. Perform routine maintenance.
19. Load code into the control of CNC machining center.
20. Align and coordinate the machine and tools.
21. Enter tool offsets and cutter geometry.
22. Test and run a program.
23. Write an operator setup document.
24. Select speeds and feeds for the type of tool and material to be machined.
25. Plan an efficient and safe program with good sequencing.
26. Identify proprietary differences in "G" and "M" codes.
27. Use the basic coded words in the program.

Cabinet Making Technology 480731

This course is an overview of the cabinet and store fixture industries. Emphasis will be placed on the design and construction of face frame as well as frameless (32mm) systems. Students will plan and build a vanity, kitchen cabinet, or shop project which utilizes contemporary casework techniques.

Prerequisites: Technical Drawing and Blueprint Reading 480719 **AND** Wood Product Manufacturing 480740

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Produce working drawings for a typical set of kitchen cabinets, both manually and with the aid of computer software.
5. Produce a cutting list needed to build a set of cabinets.
6. Demonstrate an understanding of both face and frame and 32mm systems of cabinet construction.
7. Identify standardized cabinet dimensions.
8. Differentiate between custom cabinetry and modular/mass-produced cabinetry.
9. Compare the cost of manufacturing components (doors and drawers) vs. outsourcing.
10. Identify trade associations for the cabinet and store fixture industries and review standards and certification programs.
11. Manufacture a countertop using high pressure decorative laminate.
12. Fabricate a typical cabinetry project.
13. Install a typical base and wall cabinet.
14. Solve first-degree algebra equations.
15. Apply algebraic knowledge to solve verbal problems and formulas.
16. Solve simple plan and solid geometry problems.
17. Prepare a surface/product for the finishing process.
18. Identify the factors associated with finish quality of a wood product.
19. Differentiate between paints, varnish, lacquer, shellac, polyurethane, conversion varnish, and water-based products.
20. Demonstrate contemporary application techniques for both oil-based and water-based products.
21. Explain the theory and operation of various coating technologies.
22. Disassemble, re-assemble, and adjust a conventional spray gun.
23. Develop a finishing schedule for a variety of finishing materials applied to a variety of substrates.
24. Describe EPA and OSHA regulations as they pertain to the finishing industry.

25. Evaluate and specify drying equipment, fluid handling equipment, and exhaust/filtering systems.
26. Perform standardized tests on finished surfaces to determine durability.

CAD for Wood Technology 480725

This course is designed for the fundamental principles and capabilities of CAD, basic drafting conventions and operations that are relative to the Wood Manufacturing Industry.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Produce line entities using various coordinate techniques.
5. Construct geometric shapes in two-dimensional space.
6. Develop detailed orthographic views as required.
7. Construct cross sections of various designs, with cross-hatching incorporated as desired.
8. Apply dimensions and annotations to drawings.
9. Move, copy, delete, and save drawings or portions of drawings.
10. Explore 3-D drawing techniques.

Co-op I (Wood) 480741

Co-op provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Gain career awareness and the opportunity to test career choices.
5. Receive work experience related to career interests.
6. Integrate classroom studies with work experience.
7. Receive exposure to facilities and equipment unavailable in a classroom setting.
8. Increase employability potential.
9. Earn funds to help with education expenses.

Furniture Technology 480721

Furniture design principles, structural consideration, joinery, fasteners, veneering, and use of specialized machines for complex operations are the focus of this course. Students will plan and build a piece of furniture which includes at least one drawer, a door and some veneering.

Prerequisites: Technical Drawing and Blueprint Reading 480719 **AND** Wood Product Manufacturing 480740

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Analyze a piece of furniture for "good design" qualities.
5. Interpret working drawings and visualize the construction techniques.
6. Design a furniture project which allows for expansion and contraction of the wood using solid wood, plywood, veneer, or frame and panel construction techniques.
7. Identify, evaluate and specify traditional and contemporary construction techniques.
8. Calculate machine rates, set-up times, yields, and other production control elements.
9. Set up and operate industrial woodworking equipment to perform common operations.
10. Evaluate a given production problem, formulate a plan of action and execute the plan to a satisfactory conclusion.
11. Develop skills related to the efficient operation of a rough mill, machine room, and assembly area.
12. Fabricate a piece of furniture which lends itself to specified production techniques.
13. Identify equipment capabilities and determine sequencing of operations.
14. Solve first-degree algebra equations.
15. Apply algebraic knowledge to solve verbal problems and formulas.
16. Solve simple plane and solid geometry problems.
17. Prepare a surface/product for the finishing process.
18. Identify the factors associated with the finish quality of a wood product.
19. Differentiate between paints, varnish, lacquer, shellac, polyurethane, conversion varnish, and water-based products.
20. Demonstrate contemporary application techniques for both oil-based and water-based products.
21. Explain the theory and operation of various coating technologies.
22. Disassemble, re-assemble, and adjust a conventional spray gun.
23. Develop a finishing schedule for a variety of finishing materials applied to a variety of substrates.
24. Describe EPA and OSHA regulations as they pertain to the finishing industry.

25. Evaluate and specify drying equipment, fluid handling equipment, and exhaust/filtering systems.
26. Perform standardized tests on finished surfaces to determine durability.

Internship (Wood) 480744

Internship provides supervised on-the-job experience related to the student's educational objectives. Students participating in an internship do not receive compensation.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1 - 3

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Gain career awareness and the opportunity to test career choices.
5. Receive work experience related to career interests.
6. Integrate classroom studies with work experience.
7. Receive exposure to facilities and equipment unavailable in a classroom setting.
8. Increase employability potential.

Introduction to Computer-Aided Drafting 480110

This course uses a computer graphic workstation in the application of fundamental principles and capabilities of CAD, basic drafting conventions, and operations. An in-depth study of computer-aided drafting commands, terminology, command utilization, and skill development will be included.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Describe, using correct computer terminology, basic computer functions, uses of computers in society and different types of software.
5. Discuss ethical computing issues, such as copyright, privacy, security, and property.
6. Use graphical user interface.
7. Use computer application programs.
8. Access information sources found on networks such as the internet and gain experience with web browsers, search sources, and sources of information related to his or her own field.
9. Demonstrate an awareness of different types of software applications.
10. Produce line entities using various coordinate techniques.
11. Construct geometric shapes in two-dimensional space.
12. Develop detailed orthographic views as required.
13. Construct cross sections of various designs, with cross-hatching incorporated as desired.
14. Apply dimensions and annotations to drawings.
15. Move, copy, delete, and save drawings or portions of drawings.
16. Use CAD to manipulate drawings by means of translation, rotation, scaling, zooming, panning, and windowing.
17. Explore 3-D drawing techniques.

Introduction to Panel Processing 480711

This course provides an overview of the terminology, materials, processing equipment and related software utilized by panel processing manufacturers of residential and commercial case work. Emphasis will be placed on the design and fabrication of frameless cabinetry to the use of panel saws, edge banders, CNC boring equipment, and case clamps.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Identify commercial and residential applications for panel materials.
5. Explain industry trends and panel processing equipment capabilities and techniques.
6. Identify, evaluate, and specify joinery and assembly techniques.
7. Operate various types of software for designing, cutting, and optimization for efficient use of panel goods.
8. Specify quality and quantity of materials required to fabricate frameless case work.
9. Properly layout component panels utilizing the 32mm system.
10. Set up and operate common panel processing equipment including a panel saw, edge bander, boring machine, and case clamp in a cellular manufacturing environment.
11. Generate basic machine codes and programs for running machine centers.
12. Fabricate a typical frameless piece of case work.
13. Develop and perform routine preventive maintenance on the panel saw, edge bander, boring machine, and the case clamp.
14. Develop an understanding of the different tooling requirements while working on various panel products.
15. Apply work site and lab safety procedures.
16. Apply personal safety rules and procedures.
17. Apply fire prevention rules and procedures.
18. Apply first aid procedures.
19. Explain how to obtain first aid certification.
20. Demonstrate hazardous communication procedures.
21. Describe and demonstrate universal precaution procedures.
22. Solve first-degree algebra equations.
23. Apply algebraic knowledge to solve verbal problems and formulas.
24. Solve simple plane and solid geometry problems.

Lumber Grading and Drying 480716

This course prepares an individual to master the National Hardwood Lumber Association's rules for grading hardwoods and to apply those rules in a production setting. Students will identify species and use a deductive process to grade the lumber and assign it a monetary value. Students will also be introduced to hardwood lumber drying systems. Conventional dry kilns, dehumidification, vacuum, and solar kilns are illustrated. Current theories on drying lumber to minimize defects and increase quality are demonstrated. Computer controls are explained.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Use First Aid and perform CPR.
5. Describe basic lumber economics.
6. Identify woods by physical characteristics.
7. Describe career opportunities in the wood industry.
8. List the job titles in the wood industry.
9. Calculate the unit of "board feet."
10. Define cutting, clear-faced cutting, and sound cutting.
11. Calculate the percentage of clear wood in the clear-face cutting grades.
12. Identify requirements for the standard grade of "Firsts and Seconds."
13. Identify requirements for the standard grade of "FASIF."
14. Identify requirements for the standard grade of "#1 Common."
15. Identify requirements for the standard grade of "#2A Common."
16. Identify requirements for the standard grade of "#2B Common."
17. Identify requirements for the standard grade of "#3A Common."
18. Identify requirements for the standard grade of "#3B Common."
19. Identify requirements for the standard grade of "Selects."
20. Measure using a lumber rule.
21. Apply grading practices.
22. Apply safety techniques when operating a dry kiln.
23. Identify the basic components of a lumber dry kiln.
24. Identify types of dry kilns.
25. Apply sample selection techniques in preparation for loading.
26. Calculate the moisture content of samples/sections.
27. Calculate the oven-dried weight of samples.
28. Calculate the moisture of a sample.
29. Construct a drying schedule for a particular species and thickness.
30. Apply a drying schedule in a lab kiln for species and thickness.
31. Discuss the economics of equality versus time considerations when drying lumber.

32. Apply accelerated drying schedules.
33. Maintain drying records and charts.

Millwork Technology 480717

The design of molding for doors, door frames, windows, stairs, and mantels are the focus of this course. Emphasis will be placed on construction principles, joinery, and fasteners for millwork assemblies. Students will build one or more millwork items.

Prerequisites: Technical Drawing and Blueprint Reading 480719 **AND** Wood Product Manufacturing 480740

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Interpret architectural prints and shop drawings.
5. Define the three levels utilized in the Architectural Woodworking Institute's Quality Standards.
6. Conduct field measurements of projects in process to verify dimensions.
7. Identify typical stock and custom millwork projects and products.
8. Select a profile, design a template, grind the knives, install the tooling, set up the molder, run the stock, and troubleshoot the machine.
9. Calculate feed rates needed to meet AWI specifications for millwork.
10. Fabricate one or more millwork products to a specified quality level.
11. Recognize the common sizes, types, and construction techniques used to manufacture doors, windows, and stair parts.
12. Prepare a finishing sample which reflects AWI premium grade specifications.
13. Prepare a take-off and an estimate from a set of architectural plans.
14. Sharpen cutters on an abrasive wheel or stone.

Special Problems (Wood) 480795

This course allows the student to gain intermediate experience in his/her prospective fields through projects and tasks assigned by the instructor and based on applications the student may one day experience as a professional. It sets the foundation for more in-depth projects that will be included in the student's future portfolio. It focuses on various assignments and curriculum as determined by the program instructor. This course does not count toward preparatory status.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Expand their portfolio of CAD drawings to enhance career opportunities.
5. Discuss occupation opportunities.

Technical Drawing and Blueprint Reading 480719

This course focuses on the fundamentals of multi-view and pictorial drafting techniques; and reading and interpreting architectural, furniture, and cabinet drawings. Students will apply blueprint reading skills by preparing materials and cutting lists for actual job.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Develop freehand sketching techniques used to convey object size and shape.
5. Use and care for drafting equipment and supplies properly.
6. Layout and draw orthographic, sectional, isometric, oblique, and perspective drawings.
7. Read and interpret specifications from architectural plans and detail drawings.
8. Practice industry standards for dimensioning and notation.
9. Master basic geometric construction concepts and techniques.
10. Utilize the design process to develop a solution to a problem.
11. Prepare a bill of materials for a typical wood product by performing a materials take-off from an architectural drawing.
12. Create drawings needed for route sheets, subassembly, and final assembly sheets.

Wood Finishing 480720

This course is an overview of contemporary spray finishing materials and processes for millwork assemblies. Students will learn to set up and troubleshoot a variety of common finishing systems while experimenting with finishing materials and supplies.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Prepare a surface/product for the finishing process.
5. Identify the factors associated with finish quality of a wood product.
6. Differentiate between paints, varnish, lacquer, shellac, polyurethane, conversion varnish, and water-based products.
7. Demonstrate contemporary application techniques for both oil-based and water-based products.
8. Explain the theory and operation of various coating technologies.
9. Disassemble, re-assemble, and adjust a conventional spray gun.
10. Develop a finishing schedule for a variety of finishing materials applied to a variety of substrates.
11. Describe EPA and OSHA regulations as they pertain to the finishing industry.
12. Evaluate and specify drying equipment, fluid handling equipment, and exhaust/filtering systems.
13. Perform standardized tests on finished surfaces to determine durability.
14. Apply work site and lab safety procedures.
15. Apply personal safety rules and procedures.
16. Apply fire prevention rules and procedures.
17. Apply first aid procedures.
18. Explain how to obtain first aid certification.
19. Demonstrate hazardous communication procedures.
20. Describe and demonstrate universal precaution procedures.

Wood Product Manufacturing 480740

Fundamentals of wood processing and an overview of the secondary wood processing industry are covered in this course. The nature of wood, material selection, terminology, safe setup, and operation of common woodworking equipment will be discussed. Students will fabricate a wood product while being introduced to custom woodworking techniques, as well as mass production concepts related to product engineering.

Recommended Grade Level: 9 - 12

Recommended Credit: 1

Students will:

1. Practice and perform safe shop procedures at all times.
2. Apply the technical math required for employment opportunities.
3. Perform all duties with emphasis on integrity, responsibility, quality, discipline and teamwork.
4. Discuss the characteristics of wood as a building material.
5. Specify and order lumber, veneer, plywood, particleboard, fiberboard, laminates, composite materials, hardware, and related materials and supplies.
6. Identify common species of hardwoods and softwoods.
7. Observe all safety rules and regulations when using hand tools, portable electric tools, and stationary machines.
8. Practice safe setup and operation of woodworking equipment.
9. Master basic jig and fixture design and development concepts.
10. Develop common production planning materials, route sheets, subassembly sheets and final assembly sheets.
11. Evaluate and specify appropriate joinery when assembling two or more components.
12. Describe the properties of common thermosetting and thermoplastic adhesives and the most appropriate application techniques for each.
13. Select and utilize common abrasive materials for surface preparation of the wood.
14. Apply work site and lab safety procedures.
15. Apply personal safety rules and procedures.
16. Apply fire prevention rules and procedures.
17. Apply first aid procedures.
18. Explain how to obtain first aid certification.
19. Demonstrate hazardous communications procedures.
20. Describe and demonstrate universal precaution procedures.
21. Set up and solve ratios and proportions.
22. Convert between various units of measure.
23. Solve problems involving significant digits, accuracy, and precision of measurements.
24. Perform mathematical operations with standard and metric measurement systems.

MANUFACTURING-ENGINEERING HYBRID CAREER PATHWAYS

Computerized Manufacturing and Machining (CMM) Engineering CIP 48.0510.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. CMM Engineers design, develop and run programs which direct machines to cut and shape metal or plastic for such things as airplanes, automobiles and other industrial machines. CMM Engineers use blueprints and three-dimensional computer designs to create the programs which result in precisely cut products.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210118 Mechanical Engineering
- 210135 Industrial Engineering
- 210225 Manufacturing Engineering

Complete (3) three credits:

- 470913 Fundamentals of Machine Tools-A
- 470914 Fundamentals of Machine Tools-B
- 470915 Manual Programming

Design Engineering CIP 15.1304.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Design Engineers have a working knowledge of mechanical parts as well as computer-aided design (CAD) software such as AutoCAD, Autodesk Inventor, or Solidworks. Mechanical designers begin a project by meeting with project manager, engineers, and clients to understand the needs and requirements for a new product or mechanical system. For example, designers working on a project to create an automobile engine may consult engineers regarding which structural materials to use or clients regarding engine efficiency requirements. Once materials and specifications have been determined, designers begin using CAD (computer-aided design) software to plan and develop models.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210222 Engineering II
- 210138 Technical Design I
- 210108 Technical Design II

Choose (3) three credits from the following:

- 480110 Introduction to Computer-Aided Drafting
- 480113 Engineering Graphics
- 480135 Mechanical Design
- 480136 Parametric Modeling

Fabrication Engineering CIP 14.1901.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Fabrication Engineers design parts to engineering specifications that are required for the development of metal parts and interior metal structures. Fabrication Engineers work with Sheet Metal Technicians in the development of complex geometrical parts. The Fabrication Engineer provides direct support to the manufacturing industry in the areas of design, fabrication, modification and development of metal assemblies, components and sub-assemblies.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210221 Engineering I
- 210222 Engineering II

Choose (3) three credits from the following:

- 480816 Metal Trade Information and Metals
- 480813 Parallel Line Layout
- 480817 Sheet Metal 1-A
- 480818 Sheet Metal 1-B

Industrial Maintenance Engineering CIP 14.4101.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Electrical Engineers apply electrical theory and related knowledge to diagnose and modify developmental or operational electrical machinery, electrical control equipment, and circuitry in industrial or commercial plants and laboratories. Electrical Engineers experiment with motor-control devices, switch panels, transformers, generator windings, solenoids, and other electrical equipment and components according to engineering data and knowledge of electrical principles.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210232 Electrical/Electronics Engineering
- 210230 Mechatronics Engineering
- 210225 Manufacturing Engineering
- 210135 Industrial Engineering

Complete (3) three credits:

- 470348 Industrial Maintenance Electrical Motor Controls
- 470322 Industrial Maintenance Electrical Principles
- 470330 Industrial Maintenance of PLC's

Welding Engineer CIP 15.0614.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Welding Engineers design and develop metal components for products for the pipeline, automotive, boiler making, ship building, aircraft and mobile home industry. Welding Engineers must have knowledge of cutting processes and gas metal arc welding procedures for efficient development of these industrial processes.

BEST PRACTICE COURSES

Choose (2) two credits from the following:

- 210221 Engineering I
- 210222 Engineering II
- 210138 Technical Design I
- 210108 Technical Design II

Choose (3) three credits from the following:

- 480505 Blueprint Reading for Welding
- 480501 Cutting Processes
- 480522 Gas Metal Arc Welding
- 480521 Shielded Metal Arc Welding (SMAW)

Wood Manufacturing Engineering CIP 03.0509.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. Wood Manufacturing Engineers design and create interior cabinets and wood products for homes and businesses. Wood Manufacturing Engineers consult with clients and cabinetmakers for cutting, shaping wood, preparing surfaces and forming a completed product.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210221 Engineering I
- 210225 Manufacturing Engineering

Choose (3) three credits from the following:

- 480731 Cabinet Making Technology
- 480725 CAD for Wood Technology
- 480721 Furniture Technology
- 480716 Lumber Grading and Drying
- 480740 Wood Product Manufacturing
- 480733 Advanced Wood Processing

MEDIA ARTS

MEDIA ARTS CAREER PATHWAYS

Cinematography and Video Production CIP 09.0701.00

The Cinematography and Video Production pathway prepares students to communicate dramatic information, ideas, moods, and feelings through the making and producing of videos and cinematographic expression. The pathway includes the theory of video, video technology and equipment operation, video production, video directing, video editing, cinematographic art, video and audio technique, and multi-media production. The pathway prepares students to function as staff, producers, directors, and managers of media programming and media organizations. Topics of study in this pathway include writing and editing; performing; media regulations, law, and policy; aesthetic meaning, appreciation, and analysis; construction, development, processing, modeling, simulation, and programming of audio, and moving image programs and messages; transmission, distribution, and marketing; contextual, cultural and historical aspects, and considerations.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 480901 Introduction to Media Arts
- 480910 Video Studio Fundamentals
- 480911 Studio Directing and Performance
- 480912 Advanced Studio Production - Moving Images
- 480950 Media Arts Co-op **OR** 480951 Media Arts Internship

Graphic Design CIP 50.0401.00

The Graphic Design pathway prepares students to apply skills that focus on the principles and techniques for effectively communicating ideas/information and packaging products to business and consumer audiences both in digital and other formats. Topics of study in this pathway include aesthetic meaning, appreciation, and analysis; construction, development, processing, modeling, simulation and programming of interactive experiences; transmission, distribution and marketing; contextual, cultural and historical aspects and considerations.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 480901 Introduction to Media Arts
- 480920 Two-Dimensional Media Design
- 480921 Digital Imaging
- 480922 Advanced Production Design
- 480950 Media Arts Co-op **OR** 480951 Media Arts Internship

Interactive Media CIP 10.0304.00

The Interactive Media pathway prepares students to use computer applications and related visual and sound imaging techniques to manipulate images and information originating as video, still photographs, digital copy, soundtracks, and physical objects in order to communicate messages simulating real-world content. The pathway includes instruction in specialized camerawork and equipment operation and maintenance, image capture, computer applications, dubbing, and applications to specific commercial, industrial, and entertainment needs. Topics of study in this pathway include aesthetic meaning, appreciation and analysis; construction, development, processing, modeling, simulation, and programming of interactive experiences; transmission, distribution and marketing; contextual, cultural and historical aspects and considerations.

BEST PRACTICE COURSES

Choose (4) four credits from the following:

- 480901 Introduction to Media Arts
- 480902 Interactive Design
- 480903 Moving Image Animation
- 480904 Virtual Design
- 480950 Media Arts Co-op **OR** 480951 Media Arts Internship

MEDIA ARTS COURSES

Advanced Production Design 480922

This course emphasizes an advanced and independent use of compositional theory, elements and principles of design, techniques, and creative processes for effectively performing the function of persuasion and information through use of materials and media to create visual effects to produce original authentic works. Students will demonstrate an advanced level of creative expression to a variety of authentic design products (various print mediums such as magazines, newspapers, billboards, fictional and informational texts, product wrappers, and displays) through a purposeful arrangement of images and/or text and develop a strategic product presentation both independently and as a collaborative team. The course focuses on advanced computer generated designs as well as the use of various software and hardware with an emphasis on students creating, producing, responding, and connecting in visual art and new media. An in-depth independent study of career opportunities in media art is performed. Contemporary, cultural, and historical design may be studied.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Demonstrate an advanced understanding of color models and application to diverse media.
2. Demonstrate proper equipment operation and following procedures in a safe manner and achieving one-hundred percent on a written/demonstration safety test.
3. Utilize information and ideas about the art and design around them and throughout the world.
4. Explain and use colors (HSB/RGB/CMYK/Pantone/TruMatch/Focoltone).
5. Describe and demonstrate how to apply spot color to graphics and text.
6. Identify and incorporate a variety of historical and cultural contexts in their artistic thinking and production.
7. Critically investigate and strategically interact with legal, technological, systemic, and vocational contexts of media arts.
8. Develop basic copywriting skills needed to acquire an entry level media arts job.
9. Discuss basic legal issues involved in media arts.
10. Independently select and prepare artwork for exhibition.
11. Identify and define authentic problems and significant questions for investigation.
12. Plan and manage activities to develop a solution or complete a project.
13. Collect and analyze data to identify solutions and/or make informed decisions.
14. Use multiple processes and diverse perspectives to explore alternative solutions.
15. Demonstrate the development of a professional portfolio and self-branding.
16. Independently utilize and adapt tools, styles, and systems in standard, innovative, and experimental ways in the production of complex media artworks.
17. Demonstrate an advanced skill level in one or more electronic media processes using diverse media, software, and hardware.

18. Independently and collaboratively present a product design to a client, either hypothetical or authentic.
19. Research and report on media arts related careers of their choice in planning for college/career paths.
20. Demonstrate employability skills required by business and industry.
21. Review and use portfolio presentation and interview skills.
22. Prepare portfolio of student's best work.
23. Design and produce a creative resume, cover letter, and self-promotional material.
24. Examine how related student organizations are integral parts of career and technical education courses through leadership development, school and community service projects, and competitive events.
25. Constructively critique their media art designs and the work of others while using visual arts terminology at an advanced level.
26. Connect media arts to other art forms, academic content areas, and to the global community.
27. Demonstrate and expound on the use of media artworks to consummate new meaning, knowledge, and impactful cultural experiences.
28. Make connections among the arts, other disciplines, other cultures, and the world of work.
29. Identify and explain the functional roles and activities of advertising for the marketing plan of a company.
30. Identify the two basic components that are the foundation on which all advertising is built.
31. Identify the business segments where most advertising is used and explain their differences.
32. Apply correct terminology to projects and marketing plans.
33. Identify and troubleshoot problems with marketing strategies.
34. Demonstrate an advanced independent skills level in the use of compositional theory, elements and principles of design, techniques and creative processes.
35. Demonstrative a conscientious use of a personal style.
36. Use imagination and creativity to develop multiple solutions to problems, expand their intellectual scope, and create ideas for original works of art and design.
37. Fluently employ mastered creative and innovative adaptability in formulating lines of inquiry and solutions, to address complex challenges within and through media arts productions.
38. Develop basic copywriting skills needed to acquire an entry level visual communication job.
39. Discuss basic legal issues involved in visual communication.
40. Describe and demonstrate how to apply spot color to graphic and text.

Advanced Studio Production - Moving Images 480912

In this course students will explore the creative and conceptual aspects of designing and producing moving images for the variety of cinematic, film/video, and multimedia presentations including: fictional dramas, documentaries, music videos, artistic and experimental presentations and/or installations, interactive, immersive, and performance media.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Integrate principles with a variety of methods forming original ideas, solutions, and innovations in media arts creation processes.
2. Analyze important contexts such as historical or cultural considerations and target audiences in reference to their impact on productions.
3. Produce moving image (multimedia) works that are effective in communicating ideas, thoughts, and feelings to target audiences in a variety of production genres.
4. Research production topics using the internet, video archives, and other informational sources.
5. Demonstrate an understanding of the ethics and laws that impact the production of various genres of video programs.
6. Integrate a knowledge of systems processes in forming, testing, and proposing original design ideas, prototypes, and production frameworks, considering constraints of goals, time, resources, and personal limitations.
7. Synthesize content, processes, and components to express compelling purpose, story, emotion or ideas in complex media arts productions.
8. Refine elements and components to form impactful expressions in media arts designs, directed at specific purposes, audiences, and contexts.
9. Synthesize media arts forms and academic content into unified media arts productions retaining design fidelity across platforms.
10. Employ design, technical, and soft skills in managing and producing media designs.
11. Employ creative and innovative adaptability in formulating lines of inquiry and solutions addressing challenges within and through media arts productions.
12. Utilize and adapt tools, styles, and systems in standard, innovative, and experimental ways in the production of media arts.
13. Design a presentation of media arts for intentional impacts, through a variety of contexts.
14. Evaluate, compare, and integrate improvements presenting media arts, considering personal to global impacts.
15. Determine effective media and equipment for production demands.
16. Write and edit news stories from information collected by reporters and other resources.
17. Write effective scripts in appropriate formats for genres of video production.
18. Demonstrate style and esthetic meaning in video production.
19. Supervise and coordinate the work of camera, lighting, design, and sound crew members.
20. Coordinate the activities of writers, directors, managers, and other personnel throughout the production process.

21. Conduct meetings with staff to discuss production progress and to ensure production objectives are attained.
22. Review film, recordings, or rehearsals to ensure conformance to production and broadcast standards.
23. Resolve personnel problems that arise during the production process by acting as liaisons between dissenting parties when necessary.
24. Demonstrate advanced graphics production and special effects utilizing industry standards editing tools and software.
25. Monitor postproduction processes to ensure accurate completion of details.

Digital Imaging 480921

This course is an accomplished study and production of creative and conceptual aspects of designing and producing digital imagery, graphics, and photography. This includes techniques, genres, and styles from fine arts and commercial advertising, internet and multimedia, web design, and industrial and virtual design. Students use a computer as an electronic drawing tool to solve visual communications and illustration problems in designing authentic products. This course entails an accomplished use of current software for two-dimensional illustration, creating and integrating text, using color, and importing and exporting files. Typical course topics include: aesthetic meaning and analysis of computer generated works; composing, capturing, processing, and programming of imagery and graphical information; their transmission, distribution and marketing; as well as contextual, cultural and historical aspects and considerations.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Examine careers and entrepreneurial opportunities associated with the media arts (photography).
2. Explore terminology and reporting to define terms used in digital photography.
3. Identify the application of simplicity, rule of thirds, point of view, focal points, proportion/scale, and framing.
4. Communicate a specific idea through the subject matter and the composition of a photograph.
5. Use critical thinking skills to describe, interpret, analyze, and make judgements about composition.
6. Prove knowledge of image types and how to access resulting imagines in raster based software.
7. Apply knowledge of filters.
8. Prove knowledge of color correction using industry standard photo editing/raster based software.
9. Synthesize and relate knowledge and personal experiences to make art.
10. Cite evidence of typography.
11. Revise knowledge of project management tasks and responsibilities.
12. Synthesize and relate knowledge and personal experiences to make media designs.
13. Organize and assess media arts ideas and work.
14. Demonstrate and construct a proficient understanding of marketing concepts, product development, and distribution.
15. Connect the purpose of media arts to persuasive advertising and marketing through arrangement of principles and elements of design.
16. Utilize key terminology when working with digital images.
17. Identify elements of industry standard photo editing/raster based software user interface demonstrating knowledge of its functions.
18. Demonstrate knowledge of retouching and blending images.

19. Apply knowledge of layers and masks in raster based software.
20. Apply knowledge of working with selections.
21. Apply corrections to tonal range, color, or distortions of an image.
22. Cite evidence and demonstrate of knowledge about image resolution, image size, and image file formats for web, video, and print.
23. Develop an accomplished level of techniques using multiple forms of technology to produce authentic media arts projects.
24. Demonstrate knowledge of importing, exporting, organizing, and saving designs.
25. Evaluate and strategically seek feedback for media arts projects and production processes, considering complex goals and factors.
26. Analyze, evaluate, and interpret meaning in works of media arts of self, peers, and professional works communicating verbally and in writing.
27. Refine and compare a professional portfolio reflecting personal growth and development of a personal style.
28. Research and synthesize media arts elements, aesthetics, genres, influences, styles, and techniques.
29. Employ entrepreneurial discovery strategies to generate feasible ideas for business ventures/products.
30. Demonstrate an understanding of and select the appropriate features and options required to implement a color management workflow.
31. Gain career awareness and the opportunity to test career choice.

Interactive Design 480902

This course allows students to use the creative and conceptual aspects of designing and producing interactive media arts experiences and products and services. This includes reactive (sensory-based [touch, proximity, movement] devices) and interactive technologies, 3D video game animation, interface design, mobile device applications, web multimedia, social media based, augmented, and/or virtual reality.

Recommended Grade Leve: 10 – 12

Recommended Credit: 1

Students will:

1. Define digital animation identifying uses within media arts.
2. Identify the purpose, audience, and audience needs for a project.
3. Identify multimedia project content that is relevant to the project purpose and appropriate for the target audience.
4. Identify basic principles of multimedia project usability, readability, and accessibility.
5. Demonstrates effective use of flowcharts, storyboards, wireframes, and design concepts to create media elements and a project map that maintains the planned multimedia project hierarchy.
6. Maintain effective records of creative ideas that could include: lists, journals, notebooks, sketches, storyboards, folders or other methods of organizing ideas, writing, and research.
7. Write internal and external business correspondence to convey and obtain information effectively.
8. Assess global trends and opportunities for business ventures and products and develop concepts for a new business venture to evaluate its success potential.
9. Utilize research, critical thinking, planning, and documenting skills to determine a central problem or challenge to overcome.
10. Select conceptual considerations to provide unity and flexibility in the creation of the Media Arts projects.
11. Identify and apply the processes for the development and collaboration of media projects.
12. Plan and develop strategies for effective use of the selected media and how connections arise between individual components of the work.
13. Demonstrate the importance of time and self-management.
14. Describe the importance of collaboration and roles in a design team environment.
15. Identify and apply design principles and software used for interactive media.
16. Introduce and develop the ability to form and defend value judgements about media arts and design and to communicate design ideas.
17. Apply the concepts related to visual, spatial, sound, motion, interactive and temporal elements/features of digital technology and principles for their use in the creation and application of digital media-based work.
18. Recognize competencies with principles of visual organization, including the ability to work with visual elements.
19. Introduce and demonstrate appropriate math concepts and principles related to video and animation.

Introduction to Media Arts 480901

This course is an introduction to and survey of the creative and conceptual aspects of designing media arts experiences and products, including techniques, genres and styles from various and combined media and forms, including moving image, sound, interactive, spatial and/or interactive design.

Recommended Grade Level: 9 – 11

Recommended Credit: 1

Students will:

1. Examine careers in the Media Arts.
2. Analyze ethics as it relates to Media Arts.
3. Research the history of Media Arts.
4. Explore how to collaborate and interact within teams and with clients.
5. Explore the use of technology specific to Media Arts.
6. Examine how to pitch and present a project.
7. Identify how to constructively critique fellow students work.
8. Identify an audience and when the use of specific media tools are appropriate.
9. Explore how to use the elements and principles of design.
10. Demonstrate the production process.

Media Arts Co-op 480950

Cooperative Education for CTE courses provides supervised work site experience related to the student's identified career pathway. A student must be enrolled in an approved capstone course during the same school year that the co-op experience in completed. Students who participate receive a salary for these experiences, in accordance with local, state and federal minimum wage requirements according to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Media Arts Internship 480951

Internship for CTE courses provides supervised work-site experience for high school students who are enrolled in a capstone course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester or longer and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less). All information references to the Work Based Learning Guide.

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Demonstrate and practice safe work habits at all times.
2. Gain career awareness and the opportunity to test career choices.
3. Receive work experience related to career interests.
4. Integrate classroom studies with work experience.
5. Receive exposure to facilities and equipment unavailable in a classroom setting.
6. Increase employability potential.

Moving Image Animation 480903

This course introduces students to the creative and conceptual aspects of designing and producing animated images for a variety of storytelling and multimedia presentations (dramatic narrative; artistic and experimental presentations and/or installations; ambient, interactive, immersive and performance media).

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Apply multimedia project development decisions based on your analysis and interpretation of design specifications.
2. Design and implement flowcharts, storyboards, wireframes, and design comps to create media elements and a project map that maintains the planned multimedia project hierarchy.
3. Organize and compose ideas intended for internal and external business correspondence to convey or obtain information in a cohesive, meaningful order effectively.
4. Use applicable terminology, layout, and design principles to create animations and moving images.
5. Utilize critical thinking and planning skills to determine best options and outcomes.
6. Implement processes for the development and coordination of digitally-based art and design strategies such as storyboarding, concept mapping, and the use of scenarios and personas.
7. Revise and refine project based on peer evaluations process for effective connections within individual components of the work.
8. Demonstrates effective time and self-management strategies and practices for completing individual components of the work.
9. Describe and apply the collaboration and roles in a design team environment.
10. Utilize appropriate design principles and software used for interactive media.
11. Apply principles of media critique to media arts and design projects.
12. Apply the visual, spatial, sound, motion, interactive, and temporal elements/features, concepts and principles of digital technology to the creation and application of digital media-based work.
13. Plan a media project using industry standard visual elements and principles of visual organization.
14. Demonstrate and utilize appropriate mathematical concepts and principles related to moving image animation.
15. Create short animated sequences to communicate with a specific purpose.

Studio Directing and Performance 480911

This course explores the role of the director within the studio system. Students develop knowledge and skills in studio multi-camera and field television production. Students also develop performance skills for broadcasting including interpretation of copy, news casting, and ad lib announcing. The course covers techniques of narrative and non-fiction writing and scripting, the analysis and writing of radio, television, and video materials, including storytelling and screenwriting.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Utilize methods to formulate multiple ideas, refine design goals increasing the originality of approaches in media arts creation process.
2. Write proficient quality scripts for entertainment genre video productions, including visual poems, short narratives, and music videos.
3. Write proficient quality scripts for persuasive genre video productions, including public service announcements, commercials, and promotional videos.
4. Identify news and feature story leads using a proficient knowledge of the news element.
5. Cover news events for the production of proficient quality news and feature story packages.
6. Apply a personal aesthetic in designing, testing, and refining original design ideas, prototypes, and production strategies for media arts productions.
7. Demonstrate choices in organizing and integrating content and stylistic conventions in media arts production, demonstrating understanding of associated principles.
8. Refine aesthetic elements and technical components to form impactful expressions in media arts projects for specific purposes, intentions, audiences, and contexts.
9. Select scripts for production determining how material should be interpreted and performed.
10. Research scripts determining how they should be directed.
11. Integrate various arts, media arts forms, and academic content into unified media arts productions that retain thematic integrity and stylistic continuity.
12. Demonstrate proficient knowledge of camera operations skills, applying appropriate camera angles, and demonstrating knowledge of depth of field and appropriate camera placement.
13. Demonstrate proficient knowledge of lighting techniques as applied to studio and field productions.
14. Apply proficient sound capture in studio and field productions demonstrating sound editing skills.
15. Direct productions in the studio and field demonstrating accomplished knowledge of compositional concepts and intended audience.
16. Demonstrate leadership and collaboration skills when working with peers.
17. Demonstrate skills in the use of computer software for video production and editing.

18. Demonstrate performance skills in news casting, radio announcing, hosting, and ad lib announcing.
19. Provide leadership in producing, directing, and performing in narratives and non-fiction productions.
20. Provide leadership when working with others to produce entertainment and persuasive genre video productions.
21. Obtain necessary copyright permissions complying with copyright regulations.
22. Produce scripts for information genre productions.
23. Analyze productions, evaluate programs success, and create future production goals.
24. Supervise and coordinate the work of camera, lighting, design, and sound crew members.
25. Plan details such as framing, composition, camera movement, sound, and actor movement for each shot or scene.
26. Direct live broadcasts, films and recordings, or non-broadcast programming for public entertainment or education.
27. Collaborate with technical directors, managers, crew members and writers discussing details of production.
28. Compile cue words, phrases and cue announcers, cast members and technicians during performances.
29. Identify and approve equipment and elements required for productions.
30. Consult with writers, producers, or actors about script changes or "workshop" scripts, through rehearsals with writers and actors to create final drafts.
31. Demonstrate command of design, technical and soft skills in managing and producing media arts projects.
32. Demonstrate ability in creative and adaptive innovation abilities addressing challenges within and through media arts productions.
33. Demonstrate adaptation and combination of tools, styles, techniques, and interactivity to achieve goals in the production of a variety of media art designs.
34. Design a presentation and distribution of collections of media art designs through a variety of contexts, such as mass audiences and physical and virtual channel.
35. Evaluate and implement improvements in presenting media art designs, considering personal, local, and social impacts.
36. Analyze the qualities and relationships of the components in a variety of media art designs and give feedback on how they impact an audience.
37. Analyze how a broad range of media art designs manage audience experience, create intention and persuasion through multimodal perception.
38. Analyze the intent, meanings, and influence of a variety of media art designs, based on personal, societal, historical and cultural contexts.
39. Evaluate and give constructive critique of media art designs and production processes.
40. Synthesize internal and external resources enhancing the creation of persuasive media art designs.
41. Demonstrate the use of media arts synthesizing new meaning and knowledge.
42. Demonstrate the relationships of media arts ideas and works to various contexts, purposes, and values.
43. Investigate and interact with legal, technological, systemic, and vocational contexts of media arts, considering ethics, media literacy, digital identity, and artist/audience interactivity.

Two-Dimensional Media Design 480920

This course is a proficient study and production of creative and conceptual aspects of signing and producing digital imagery, graphics, and photography. This includes techniques, genres, and styles from fine arts and commercial advertising, internet and multimedia, web design, and industrial and virtual design. Students use a computer as an electronic drawing tool to solve visual communications and illustration problems in designing products. This course entails the use of current software for two-dimensional illustration, creating and integrating text, using color, and importing and exporting files.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Begin to develop a professional portfolio reflecting their personal growth and development of a personal style.
2. Examine careers and entrepreneurial opportunities associated with the media arts and looking specifically at Interactive Design and multimedia animators and artists.
3. Research and synthesize historical and cultural knowledge of media arts aesthetics, genres, influences, styles, and techniques.
4. Identify the purpose, audience, and audience needs for preparing graphics.
5. Demonstrate standard copyright rules for artwork, graphics, and graphic use.
6. Demonstrate project management tasks and responsibilities.
7. Communicate with others (such as peers and clients) about design plans.
8. Demonstrate a proficient level of compositional theory, principles and elements of design electronic two-dimensional drawing processes using diverse media.
9. Gain functional competence with principles of visual organization, including the ability to work with visual elements in two and three dimensions; color theory and its applications; and drawing.
10. Develop an understanding of the common elements and vocabulary of art/design and of the interaction of these elements, and be able to employ this knowledge in analysis.
11. Identify and use tools and materials for freehand drawing.
12. Demonstrate the ability to transfer traditional drawing knowledge and skills to electronic media.
13. Identify and apply method for producing perspective drawing.
14. Demonstrate design principles, elements, and graphic composition.
15. Demonstrate graphic resolution, graphic size, and graphic file formats for web, video, and print.
16. Demonstrate effective use of typography.
17. Demonstrate effective use of symbols and representative graphics.
18. Define key terminology when working with graphics.
19. Develop a proficient level of techniques using multiple forms of technology to produce media art works specifically in two-dimensional media.
20. Identify elements of the vector based drawing software user interface and demonstrate knowledge of their functions.

21. Use non-printing design tools in the software interface.
22. Demonstrate an understanding of and select the appropriate features and options required to manage color, pattern, and gradient swatches.
23. Demonstrate an understanding of vector drawing concepts.
24. Demonstrate how to work with brushes, symbols, graphic styles, and patterns.
25. Demonstrate layers and masks.
26. Import, export, and save files.
27. Demonstrate how to create documents.
28. Demonstrate effective use of drawing and shape tools.
29. Demonstrate how to effectively use type tools.
30. Demonstrate how to effectively use scanned or photographic images.
31. Demonstrate the ability to create realistic graphics.
32. Demonstrate how to effectively modify and transform objects.
33. Create proficient graphic arts products that communicate ideas, thoughts, and feelings specific to a target audience.
34. Develop a proficient level of techniques using multiple forms of technology to produce media art works specifically in two dimensional graphics.
35. Collaboratively and individually demonstrate a proficient use of marketing concepts, product development, and distribution concepts.
36. Prepare vector graphics for web, print, and video.
37. Review and explain the role of advertising as an integral part of a company's marketing strategy.
38. Produce an advertisement for print media.
39. Demonstrate standard copyright rules for content use in page layouts.
40. Demonstrate project management tasks and responsibilities.
41. Communicate with others (such as peers and clients) about design plans.
42. Demonstrate appropriate properties of page layouts for print, web, and digital publishing.
43. Demonstrate design principles, elements, and page layout composition.
44. Apply key terminology when working with page layouts.
45. Identify elements of the page layout and design software interface and demonstrate knowledge of their functions.
46. Demonstrate usage of features and options required to manage colors.
47. Demonstrate effective use of layers.
48. Demonstrate exporting, packaging, saving, and organizing files.
49. Demonstrate how to create multiple-page documents.
50. Demonstrate how to use styles.
51. Demonstrate how to use frames in a page layout.
52. Add text to a page layout.
53. Add graphic, image, and video content to a page layout.
54. Demonstrate how to create special page elements using page layout and design software tools.
55. Demonstrate how to add interactive elements using page layout and design software.
56. Demonstrate how to prepare page layouts for publishing to print.
57. Demonstrate how to prepare page layouts for export to multi-screen devices.

Video Studio Fundamentals 480910

This course will expose students to the materials, processes, and artistic techniques involved in creating video productions. Students learn about the operation of cameras, lighting techniques, camera angles, depth of field, composition, storyboarding, sound capture, and editing techniques. Course topics may include production values and various styles of video production including documentary, storytelling, news magazines, and animation. Students may be exposed to digital and traditional film. As students advance, they are encouraged to develop their own artistic styles. Major filmmakers, cinematographers, video artist, and their work may be studied.

Recommended Grade Level: 10 – 12

Recommended Credit: 1

Students will:

1. Utilize identified methods to formulate multiple ideas, develop media arts goals, and problem-solve in media arts creation processes.
2. Apply aesthetic criteria in developing, proposing, and refining design ideas, plans, prototypes, and production processes for media arts productions, considering original inspirations, goals, and presentation.
3. Consolidate productions processes to demonstrate choice in organizing and integrating content and stylistic conversations in media arts production, demonstrating understanding of associated principles.
4. Refine and elaborate aesthetic elements and technical components to intentionally form impactful expressions in media arts projects for specific purposes, intentions, audiences, and contexts.
5. Integrate multiple contents and forms into unified media arts productions that convey specific themes or ideas, such as interdisciplinary projects for multimedia theatre.
6. Demonstrate a defined range of design, technical and soft skills, through performing specified roles in producing media arts projects, such as strategizing and collaborative communication.
7. Define a range of creative and adaptive innovation abilities such as divergent solutions and vending conventions, in developing new solutions for identified problems within and through media arts productions.
8. Demonstrate adaptability using tools, techniques, and content in standard and experimental ways to communicate intent in the production of media arts projects.
9. Apply basic knowledge of camera operation skills, including applying appropriate camera placement.
10. Apply basic knowledge of lighting techniques as applied to studio and field productions.
11. Apply basic sound capture and sound editing skills in studio productions.
12. Write basic scripts for production using the appropriate genre formats.
13. Write for the purposes of production, persuasion, information, and narration.
14. Utilize conventions of Standard English, including capitalization, punctuation, and spelling when writing.
15. Generate new ideas in scripting, creating, and applying storyboards in the production of videos.

16. Work with peers completing jobs associated with the various styles of studio, field, and film style production.
17. Demonstrate basic skills in the use of computer software for video production and editing.
18. Demonstrate basic performance skills in news casting, hosting, and ad lib announcing.
19. Write scripts for entertainment genre video production, including visual poems, short narrative, and music videos collaborating with others.
20. Write scripts for persuasive genre video productions, including public service announcements, commercials, and promotional videos collaborating with others.
21. Identify news and feature story leads using a basic knowledge of news elements.
22. Cover news events for the production of news and feature story packages.
23. Demonstrate journalistic ethics in story coverage and production.
24. Schedule and complete interviews for produced packages.
25. Comply with copyright requirements in production.
26. Write scripts for information genre video productions, including news and sports stories, and news feature packages collaborating with others.
27. Review assembled films of edited video on screens or monitors determining if corrections are warranted.
28. Trim film or video segments to specified lengths and reassemble segments in sequences that present stories with maximum effect.
29. Select and combine the most effective shots of each scene to form a logical and smoothly running story.
30. Edit films and videotapes to insert music, dialogue, and sound effects arranging films into sequences correcting errors using editing equipment.
31. Cut shot sequences to different angles at specific points in scenes, making each individual cut as fluid and seamless as possible.
32. Determine the specific audio and visual effects and music necessary to complete films.
33. Set up and operate computer editing systems, electronic titling systems, video switching equipment, and digital video effects units to produce a final product.
34. Design the presentation and distribution of collections of media arts projects considering combinations of designs, formats, and audiences.
35. Evaluate making improvements in presenting media arts productions, considering personal and local impacts, such as the benefits for self and other.
36. Analyze and evaluate video productions using quality standards.
37. Analyze the qualities of and relationships between the components, style, and preferences communicated by media arts and artists.
38. Analyze how a variety of media art designs manage audience experience and create intention through multimodal perception.
39. Analyze the intent, meanings, and reception of a variety of media arts, focusing on personal and cultural contexts.
40. Evaluate media arts and production processes at decisive stages, using identified criteria and considering context and design goals.
41. Access, evaluate, and integrate personal and external resources to inform the creation of original media arts projects, such as experiences, interests, and cultural experiences.
42. Explain and demonstrate the use of media arts to expand meaning and knowledge, creating cultural experiences, such as learning and sharing through online environments.

43. Demonstrate and explain how media arts and ideas relate to various contexts, purposes and values, such as social trends, power, equality, and personal/cultural identity.
44. Critically evaluate and effectively interact with legal, technological, systemic and vocational contexts of media arts, considering ethics, media literacy, social media, virtual worlds, and digital identity.

Virtual Design 480904

This course introduces students to the creative and conceptual aspects of designing and producing simulative and virtual, 3D media arts experiences, products and services for storytelling and multimedia presentations (dramatic narratives; artistic and experimental presentations and/or installations; ambient, interactive, immersive and performance media).

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. Demonstrate personal growth and personal style through a professional portfolio.
2. Demonstrate from media art careers and entrepreneurial opportunities one or two specific careers specifically looking at directors, animators, and game developers.
3. Research and analyze data in film, animation, and gaming careers.
4. Research and synthesize historical and cultural knowledge of media arts aesthetics, genres, influences, styles, and techniques relating to film, animation, and gaming.
5. Research technological advances in the field of film, animation, and gaming.
6. Identify the purpose, audience, and audience needs for preparing animated stories and games.
7. Demonstrate standard copyright rules for artwork, animation, and graphic use.
8. Demonstrate project management tasks and responsibilities.
9. Communicate with others (such as peers and clients) about animation and game design plans.
10. Demonstrate a proficient level of compositional theory, principles, and elements of design animations and gaming using diverse media.
11. Make development decisions based on your analysis and interpretation of animation and game design specifications.
12. Demonstrates knowledge of flowcharts, storyboards, and wireframes to create animations and games.
13. Identify basic principles of usability, readability, and accessibility.
14. Practice brainstorming and ideation to develop a concept.
15. Conduct visual research to provide reference for a project.
16. Model and create objects using a variety of tools and techniques.
17. Conceptualize and utilize virtual 3D space.
18. Compare and contrast modeling methodologies (for example, polygons, NURBS, splines).
19. Explain the application of low polygon and high polygon construction.
20. Modify and manipulate polygonal and NURBS objects.
21. Modify and apply surface attributes.
22. Animate textures over time.
23. Create an original texture.
24. Identify UVW mapping coordinates.
25. Explain various mapping techniques.
26. Create normal maps.

27. Describe the difference between forward and inverse kinematics.
28. Create a parent/child hierarchy.
29. Create a joint/bone chain.
30. Practice skinning models.
31. Apply and adjust weight maps.
32. Apply rotational limits to joints.
33. Explain the use of constraints to animate objects.
34. Demonstrate the use of constraints to animate objects.
35. Explain the properties and uses of different types of lights.
36. Create animated lighting.
37. Use three point lighting in a project.
38. Compare and contrast indirect lighting and direct lighting.
39. Create environmental lighting.
40. Describe the use of final gather and global illumination.
41. Effectively demonstrate the 12 basic principles of animation.
42. Apply the principles of animation to animated sequences.
43. Explain the role of visual language in an animation project.
44. Visually communicate concepts and ideas.
45. Illustrate actions with sequential panels.
46. Evaluate storyboards for effectiveness and feasibility.
47. Revise and refine storyboards.
48. Describe appropriate shop composition for desired results.
49. Compare and contrast types of camera movements.
50. Create and modify key frames and key poses.
51. Change an objects state of position over time.
52. Establish an object's relative speed.
53. Demonstrate an object following a path.
54. Simulate a naturally occurring or mechanical cycle such as walking.
55. Apply various animation techniques such as pose-to-pose and straight ahead.
56. Identify rendering types and purposes.
57. Apply appropriate rendering settings for a project.
58. Render a sequence of frames.
59. Create a particle system.
60. Create atmospheric effects.
61. Adjust the dynamic properties such as gravity and wind speed.
62. Simulate soft dynamics such as fabric.
63. Simulate rigid body dynamics such as shattering wall and breaking glass.
64. Create animated cameras.
65. Use multiple cameras in a scene.
66. Evaluate and select camera settings to achieve desired results.
67. Place cameras to match an existing storyboard.
68. Demonstrate editing techniques.
69. Manipulate and apply audio to an animation project.
70. Select appropriate distribution format.
71. Render for distribution.
72. Demonstrate compositing by using a variety of techniques.

73. Demonstrate knowledge of how to organize and plan a video sequence.
74. Demonstrate knowledge of visual techniques for enhancing video content.
75. Demonstrate knowledge of using audio to enhance video content.
76. Demonstrate knowledge of using still images to enhance video content.
77. Identify elements of the Video Editing Software interface.
78. Identify the functions of Video Editing Software interface elements.
79. Organize and customize the Video Editing Software workspaces.
80. Import media assets (video, image, and audio files).
81. Organize and manage video clips in a sequence.
82. Trim clips.
83. Manage sound in a video sequence.
84. Manage superimposed text and shapes in a video sequence.
85. Add and manage effects and transitions in a video sequence.
86. Demonstrate knowledge of export options for video.
87. Demonstrate knowledge of how to export video from Video Editing Software.
88. Produce designs that work equally well on various operating systems, browser versions/configurations, and devices.
89. Investigate notable milestones in the development of media arts products, including platforms, hardware and software changes, and advancements.
90. Analyze and critique how society has viewed 3D media products.
91. Differentiate between the varied production roles fulfilled by team members.
92. Apply the concepts of hardware and software development methodologies to 3D media.
93. Analyze and critique design goals in accordance with the target audience and desired response.
94. Design interfaces that communicate appropriate design information using the principles of human-computer interactions.
95. Synthesize the talents of a multi-disciplinary team to complete the development.
96. Investigate relevant external application programming interfaces and use them where appropriate.
97. Apply the concepts of probability and statistics to various aspects of design systems and environment.
98. Acquire mastery of advanced programming concepts as needed to complete design projects.
99. Collaboratively and individually demonstrate a proficient understanding of marketing concepts, product development, and distribution.

TRANSPORTATION EDUCATION

AUTOMOTIVE EDUCATION CAREER PATHWAYS

Automotive Maintenance and Light Repair Technician CIP 47.0604.01

This is a program that prepares individuals to apply technical knowledge and skills to repair, service, and maintain all types of automobiles. It includes instruction in brake systems, electrical systems, engine performance, engine repair, suspension and steering, automatic and manual transmissions and drive trains, and heating and air conditioning systems.

BEST PRACTICE COURSES

Complete (4) four credits from the following:

- 470507 Automotive Maintenance and Light Repair Section A
- 470509 Automotive Maintenance and Light Repair Section B
- 470511 Automotive Maintenance and Light Repair Section C
- 470513 Automotive Maintenance and Light Repair Section D

Automobile Service Technician CIP 47.0604.02

This is a program that prepares individuals to apply technical knowledge and skills to repair, service, and maintain all types of automobiles. It includes instruction in brake systems, electrical systems, engine performance, engine repair, suspension and steering, automatic and manual transmissions and drive trains, and hearing and air conditioning systems.

BEST PRACTICE COURSES

Complete (4) four credits from the Automobile Maintenance and Light Repair Technician Pathway

Complete (4) four credits from the following:

- 470515 Automobile Service Technology Section A
- 470517 Automobile Service Technology Section B
- 470519 Automobile Service Technology Section C
- 470521 Automobile Service Technology Section D

Automotive Engineering CIP 15.0803.00

This pathway provides the opportunity to blend Career and Technical Education (CTE) courses with Engineering courses to help students apply technical skills along with Science, Technology, Engineering, and Math (STEM) skills to solve real-world problems. This pathway prepares individuals to apply engineering principles and technical skills in support of engineers and other professionals engaged in developing, manufacturing, and testing self-propelled ground vehicles and their systems. It includes instruction in vehicular systems technology, design and development testing, prototype and operational testing, inspection and maintenance procedures, instrument calibration, test equipment operation and maintenance, and report preparation.

BEST PRACTICE COURSES

Complete (2) two credits:

- 210221 Engineering I
- 210232 Electrical/Electronics Engineering

Complete (4) four credits:

- 470507 Automotive Maintenance and Light Repair Section A
- 470509 Automotive Maintenance and Light Repair Section B
- 470511 Automotive Maintenance and Light Repair Section C
- 470513 Automotive Maintenance and Light Repair Section D

AUTOMOTIVE EDUCATION COURSES

Automobile Service Technology Section A 470515

These courses present the theory, component identification, operation, diagnosis, and the service and repair of Engines, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Automatic and Manual Transmissions/Transaxles, and Engine Performance Systems. In all areas, appropriate theory, safety, and support instruction will be taught and required for performing each task. The instruction will also include identification and use of appropriate tools and testing/measurement equipment required to accomplish certain tasks. The student will also locate and use current reference and training materials from accepted industry publications and resources and write industry standard work orders. **Courses A, B, C and D can be completed in any sequence.**

Prerequisite: Completion of all Automotive Maintenance and Light Repair Courses (Sections A, B, C, and D)

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Identify general shop safety rules and procedures.
2. Utilize safe procedures for handling of tools and equipment.
3. Identify and use proper placement of floor jacks and jack stands.
4. Identify and use proper procedures for safe lift operation.
5. Utilize proper ventilation procedures for working within the lab/shop area.
6. Identify marked safety areas.
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
8. Identify the location and use of eye wash stations.
9. Identify the location of the posted evacuation routes.
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
11. Identify and wear appropriate clothing for lab/shop activities.
12. Secure hair and jewelry for lab/shop activities.
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high-voltage circuits.
14. Demonstrate awareness of the safety aspects of high-voltage circuits (such as high-intensity discharge (HID) lamps, ignition systems, and injection systems).
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).
16. **ENGINE REPAIR:**
    a. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
    b. Inspect, remove and replace engine mounts.

c. Remove and re-install engine in an OBDII or newer vehicle; reconnect all attaching components and restore the vehicle to running condition.
d. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures.
e. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.
f. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action.
g. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.
h. Establish camshaft position sensor indexing.
i. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer).
j. Identify causes of engine overheating.
k. Inspect, remove, and replace water pump.
l. Remove and replace radiator.
m. Inspect and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.
n. Perform oil pressure tests; determine necessary action.
o. Inspect auxiliary coolers; determine necessary action.
p. Inspect, test, and replace oil temperature and pressure switches and sensors.

17. AUTOMATIC TRANSMISSION AND TRANSAXLE:

a. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action.
b. Diagnose fluid loss and condition concerns; determine necessary action.
c. Perform stall test; determine necessary action.
d. Perform lock-up converter system tests; determine necessary action.
e. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.
f. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).
g. Inspect for leakage; replace external seals, gaskets, and bushings.
h. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses.
i. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.
j. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings.
k. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.

18. **MANUAL DRIVE TRAIN AND AXLES:**

a. Identify and interpret drive train concerns; determine necessary action.
b. Check fluid condition; check for leaks; determine necessary action.

c. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.
d. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action.
e. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable).
f. Bleed clutch hydraulic system.
g. Inspect flywheel and ring gear for wear and cracks; determine necessary action.
h. Measure flywheel runout and crankshaft end play; determine necessary action.
i. Inspect, adjust, and reinstall shift link ages, brackets, bushings, cables, pivots, and levers.
j. Diagnose constant-velocity (CV) joint noise and vibration concerns; perform necessary action.
k. Diagnose universal joint noise and vibration concerns; perform necessary action.
l. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.
m. Inspect and replace companion flange and pinion seal; measure companion flange runout.
n. Remove and replace drive axle shafts.
o. Inspect and replace drive axle shaft seals, bearings, and retainers.
p. Measure drive axle flange runout and shaft end play; determine necessary action.

19. **FOUR-WHEEL DRIVE/ALL-WHEEL DRIVE:**
    a. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.
    b. Inspect front-wheel bearings and locking hubs; perform necessary action(s).
    c. Identify concerns related to variations in tire circumference and/or final drive ratios.
    d. Clean and inspect differential housing; check for leaks; inspect housing vent.
    e. Check and adjust differential housing fluid level.
    f. Drain and refill differential housing.
    g. Check for leaks at drive assembly seals; check vents; check lube level.
20. **SUSPENSION AND STEERING:**
    a. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
    b. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.
    c. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.
    d. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.
    e. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.
    f. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.
    g. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.

h. Remove and reinstall power steering pump.
i. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.
j. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
k. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
l. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action.
m. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.
n. Inspect, remove and install upper and lower control arms, bushings, shafts, and rebound bumpers.
o. Inspect, remove and install strut rods and bushings.
p. Inspect, remove and install upper and/or lower ball joints (with or without wear indicators).
q. Inspect, remove and install steering knuckle assemblies.
r. Inspect, remove and install short and long arm suspension system coil springs and spring insulators.
s. Inspect, remove and install torsion bars and mounts.
t. Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links.
u. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.
v. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings.
w. Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts.
x. Remove, inspect, and service or replace front and rear wheel bearings.
y. Describe the function of the power steering pressure switch.
z. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.
aa. Perform pre-alignment inspection and measure vehicle ride height; perform necessary action.
bb. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber, and toe as required; center steering wheel.
cc. Check toe-out-on-turns (turning radius); determine necessary action.
dd. Check SAI (steering axis inclination) and included angle; determine necessary action.
ee. Check rear wheel thrust angle; determine necessary action.
ff. Check for front wheel setback; determine necessary action.
gg. Check front and/or rear cradle (sub-frame) alignment; determine necessary action.
hh. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
ii. Measure wheel, tire, axle flange, and hub runout; determine necessary action.
jj. Diagnose tire pull problems; determine necessary action.

21. **BRAKES:**

a. Identify and interpret brake system concerns; determine necessary action.
b. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).
c. Check master cylinder for internal/external leaks and proper operation; determine necessary action.
d. Remove, bench bleed, and reinstall master cylinder.
e. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action.
f. Replace brake lines, hoses, fittings, and supports.
g. Fabricate brake lines using proper material and flaring procedures (double flare and ISO).
h. Inspect, test, and/or replace components of brake warning light system.
i. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
j. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action.
k. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action.
l. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action.
m. Measure and adjust master cylinder pushrod length.
n. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action.
o. Remove and reinstall sealed wheel bearing assembly.
p. Identify and inspect electronic brake control system components; determine necessary action.

22. **ELECTRICAL/ELECTRONIC SYSTEMS:**
    a. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.
    b. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.
    c. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action.
    d. Repair wiring harness.
    e. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
    f. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.
    g. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action.
    h. Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action.
    i. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action.
    j. Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action.

k. Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.
l. Diagnose (troubleshoot) windshield washer problems; perform necessary action.
m. Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action.
n. Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action.
o. Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action.
p. Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action.
q. Check for module communication errors (including CAN/BUS systems) using a scan tool.

23. **HEATING AND AIR CONDITIONING:**
    a. Identify and interpret heating and air conditioning problems; determine necessary action.
    b. Performance test A/C system; identify problems.
    c. Identify abnormal operating noises in the A/C system; determine necessary action.
    d. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
    e. Leak test A/C system; determine necessary action.
    f. Inspect condition of refrigerant oil removed from A/C system; determine necessary action.
    g. Determine recommended oil and oil capacity for system application.
    h. Using a scan tool, observe and record related HVAC data and trouble codes.
    i. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.
    j. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity.
    k. Determine need for an additional A/C system filter; perform necessary action.
    l. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.
    m. Inspect A/C condenser for airflow restrictions; perform necessary action.
    n. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity.
    o. Remove, inspect, and install expansion valve or orifice (expansion) tube.
    p. Inspect evaporator housing water drain; perform necessary action.
    q. Inspect and test heater control valve(s); perform necessary action.
    r. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.
    s. Diagnose A/C compressor clutch control systems; determine necessary action.
    t. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.
    u. Inspect and test A/C-heater control panel assembly; determine necessary action.

v. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action.
w. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.
x. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.
y. Identify and recover A/C system refrigerant.
z. Recycle, label, and store refrigerant.
aa. Evacuate and charge A/C system; add refrigerant oil as required.

24. **ENGINE PERFORMANCE:**
    a. Identify and interpret engine performance concerns; determine necessary action.
    b. Diagnose abnormal engine noises or vibration concerns; determine necessary action.
    c. Diagnose abnormal exhaust color, odor, and sound; determine necessary action.
    d. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.
    e. Verify engine operating temperature; determine necessary action.
    f. Verify correct camshaft timing.
    g. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
    h. Access and use service information to perform step-by-step (troubleshooting) diagnosis.
    i. Perform active tests of actuators using a scan tool; determine necessary action.
    j. Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action.
    k. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.
    l. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary.
    m. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.
    n. Check fuel for contaminants; determine necessary action.
    o. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.
    p. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.
    q. Inspect and test fuel injectors.
    r. Verify idle control operation.
    s. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform necessary action.
    t. Perform exhaust system back-pressure test; determine necessary action.
    u. Diagnose oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action.
    v. Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.

w. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.
x. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.
y. Inspect and test catalytic converter efficiency.
z. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.
aa. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.

Automobile Service Technology Section B 470517

The entire description and all Tasks/Standards for the Automobile Service Technology Sections A, B, C, and D are listed in the Automobile Service Technology Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Automobile Service Technology Section C 470519

The entire description and all Tasks/Standards for the Automobile Service Technology Sections A, B, C, and D are listed in the Automobile Service Technology Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Automobile Service Technology Section D 470521

The entire description and all Tasks/Standards for the Automobile Service Technology Sections A, B, C, and D are listed in the Automobile Service Technology Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Automotive Internship I 470504

Internship for CTE courses provides supervised work-site experience for high school students who are enrolled in a capstone course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester or longer and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less).

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Automotive Maintenance and Light Repair Section A 470507

These courses introduce the student to the principles, theories, and concepts of Automotive Technology and include instruction in the maintenance and light repair of Engines, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Automatic and Manual Transmission/Transaxles, and Engine Performance Systems. In all areas, appropriate theory, safety, and support instruction will be taught and required for performing each task, including proper care and cleaning of customers' vehicles. The instruction will also include identification and use of appropriate tools and test/measurement equipment required to accomplish certain tasks. The student will also receive the necessary training to locate and use current reference and training materials from accepted industry publications and resources and demonstrate the ability to write work orders. **Courses A, B, C, and D can be completed in any sequence.**

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Identify general shop safety rules and procedures.
2. Utilize safe procedures for handling of tools and equipment.
3. Identify and use proper placement of floor jacks and jack stands.
4. Identify and use proper procedures for safe lift operation.
5. Utilize proper ventilation procedures for working within the lab/shop area.
6. Identify marked safety areas.
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
8. Identify the location and use of eye wash stations.
9. Identify the location of the posted evacuation routes.
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
11. Identify and wear appropriate clothing for lab/shop activities.
12. Secure hair and jewelry for lab/shop activities.
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, and injection systems).
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).
16. Identify tools and their usage in automotive applications.
17. Identify standard and metric designation.
18. Demonstrate safe handling and use of appropriate tools.
19. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
20. Demonstrate proper use of precision measuring tools (for example, micrometer, dial-indicator, and dial-caliper).
21. Identify information needed and the service requested on a repair order.

22. Identify purpose and demonstrate proper use of fender covers, mats.
23. Demonstrate use of the three C's (concern, cause, and correction).
24. Review vehicle service history.
25. Complete Work Order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
26. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover).
27. **ENGINE REPAIR:**
    a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
    b. Verify operation of the instrument panel engine warning indicators.
    c. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
    d. Install engine covers using gaskets, seals, and sealers as required.
    e. Remove and replace timing belt; verify correct camshaft timing.
    f. Perform common fastener and thread repair to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
    g. Identify hybrid vehicle internal combustion engine service precautions.
    h. Adjust valves (mechanical or hydraulic lifters).
    i. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action.
    j. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
    k. Remove, inspect, and replace thermostat and gasket/seal.
    l. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.
    m. Perform engine oil and filter change.
28. **AUTOMATIC TRANSMISSION AND TRANSAXLE:**
    a. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
    b. Check fluid level in a transmission or a transaxle equipped with a dip-stick.
    c. Check fluid level in a transmission or a transaxle not equipped with a dip-stick.
    d. Check transmission fluid condition; check for leaks.
    e. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
    f. Inspect for leakage at external seals, gaskets, and bushings.
    g. Inspect power train mounts.
    h. Drain and replace fluid and filter(s).
    i. Describe the operational characteristics of a continuously variable transmission (CVT).
    j. Describe the operational characteristics of a hybrid vehicle drive train.
29. **MANUAL DRIVE TRAIN AND AXLES:**
    a. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
    b. Drain and refill manual transmission/transaxle and final drive unit.

c. Check fluid condition; check for leaks.
d. Check and adjust clutch master cylinder fluid level.
e. Check for system leaks.
f. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.
g. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.
h. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.
i. Clean and inspect differential housing; check for leaks; inspect housing vent.
j. Check and adjust differential housing fluid level.
k. Drain and refill differential housing.
l. Inspect and replace drive axle wheel studs.
m. Inspect front-wheel bearings and locking hubs.
n. Check for leaks at drive assembly seals; check vents; check lube level.

30. **SUSPENSION AND STEERING SYSTEMS:**
a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
b. Disable and enable supplemental restraint system (SRS).
c. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
d. Determine proper power steering fluid type; inspect fluid level and condition.
e. Flush, fill, and bleed power steering system.
f. Inspect for power steering fluid leakage; determine necessary action.
g. Inspect for power steering fluid leakage; determine necessary action.
h. Inspect and replace power steering hoses and fittings.
i. Replace power steering pump filter(s).
j. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
k. Inspect tie rod ends (sockets), tie rod sleeves, and clamps.
l. Inspect upper and lower control arms, bushings, and shafts.
m. Inspect and replace rebound and jounce bumpers.
n. Inspect track bar, strut rods/radius arms, and related mounts and bushings.
o. Inspect upper and lower ball joints (with or without wear indicators).
p. Inspect suspension system coil springs and spring insulators (silencers).
q. Inspect suspension system torsion bars and mounts.
r. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.
s. Inspect strut cartridge or assembly.
t. Inspect front strut bearing and mount.
u. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.
v. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
w. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
x. Inspect electric power-assisted steering.
y. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
z. Describe the function of the power steering pressure switch.

aa. Perform pre-alignment inspection and measure vehicle ride height; determine necessary action.
bb. Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action.
cc. Rotate tires according to manufacturer's recommendations.
dd. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
ee. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
ff. Inspect tire and wheel assembly for air loss; perform necessary action.
gg. Repair tire using internal patch.
hh. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps.
ii. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.

31. **BRAKES:**
    a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
    b. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).
    c. Measure breaks pedal height, travel, and free play (as applicable); determine necessary action.
    d. Check master cylinder for external leaks and proper operation.
    e. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action.
    f. Select, handle, store, and fill brake fluids to proper level.
    g. Identify components of brake warning light system.
    h. Bleed and/or flush brake system.
    i. Test brake fluid for contamination.
    j. Remove, clean, inspect, and measure brake drum diameter; determine necessary action.
    k. Refinish brake drum and measure final drum diameter; compare with specifications.
    l. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
    m. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
    n. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.
    o. Install wheel and torque lug nuts.
    p. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
    q. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.

r. Remove, inspect, and replace pads and retaining hardware; determine necessary action.
s. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
t. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action.
u. Remove and reinstall rotor.
v. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
w. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
x. Retract and re-adjust caliper piston on an integral parking brake system.
y. Check brake pad wear indicator; determine necessary action.
z. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.
aa. Check brake pedal travel with, and without, engine running to verify proper power booster operation.
bb. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
cc. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.
dd. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.
ee. Check parking brake operation and parking brake indicator light system operation; determine necessary action.
ff. Check operation of brake stop light system.
gg. Replace wheel bearing and race.
hh. Identify traction control/vehicle stability control system components.
ii. Describe the operation of a regenerative braking system.

32. **ELECTRICAL/ELECTRONIC SYSTEMS:**
a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
b. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
c. Use wiring diagrams to trace electrical/electronic circuits.
d. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
e. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
f. Check operation of electrical circuits with a test light.
g. Check operation of electrical circuits with fused jumper wires.
h. Measure key-off battery drain (parasitic draw).
i. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
j. Perform solder repair of electrical wiring.
k. Replace electrical connectors and terminal ends.

l. Perform battery state-of-charge test; determine necessary action.
m. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.
n. Maintain or restore electronic memory functions.
o. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
p. Perform slow/fast battery charge according to manufacturer's recommendations.
q. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
r. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
s. Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
t. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.
u. Perform starter current draw test; determine necessary action.
v. Perform starter circuit voltage drop tests; determine necessary action.
w. Inspect and test starter relays and solenoids; determine necessary action.
x. Remove and install starter in a vehicle.
y. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.
z. Perform charging system output test; determine necessary action.
aa. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
bb. Remove, inspect, and re-install generator (alternator).
cc. Perform charging circuit voltage drop tests; determine necessary action.
dd. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
ee. Aim headlights.
ff. Identify system voltage and safety precautions associated with high-intensity discharge headlights.
gg. Disable and enable airbag system for vehicle service; verify indicator lamp operation.
hh. Remove and reinstall door panel.
ii. Describe the operation of keyless entry/remote-start systems.
jj. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
kk. Verify windshield wiper and washer operation; replace wiper blades.

33. **HEATING AND AIR CONDITIONING:**
a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
b. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
c. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.
d. Inspect A/C condenser for airflow restrictions; determine necessary action.
e. Inspect engine cooling and heater systems hoses; perform necessary action.

f. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.
g. Identify the source of A/C system odors.

34. **ENGINE PERFORMANCE:**
    a. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
    b. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
    c. Perform cylinder power balance test; determine necessary action.
    d. Perform cylinder cranking and running compression tests; determine necessary action.
    e. Perform cylinder leakage test; determine necessary action.
    f. Verify engine operating temperature.
    g. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.
    h. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
    i. Describe the importance of operating all OBDII monitors for repair verification.
    j. Replace fuel filter(s).
    k. Inspect, service, or replace air filters, filter housings, and intake duct work.
    l. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.
    m. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed.
    n. Check and refill diesel exhaust fluid (DEF).
    o. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.

Automotive Maintenance and Light Repair Section B 470509

The entire description and all Tasks/Standards for the Automotive Maintenance and Light Repair Sections A, B, C, and D are listed in the Automotive Maintenance and Light Repair Section A.
Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.

Automotive Maintenance and Light Repair Section C 470511

The entire description and all Tasks/Standards for the Automotive Maintenance and Light Repair Sections A, B, C, and D are listed in the Automotive Maintenance and Light Repair Section A.
Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.

Automotive Maintenance and Light Repair Section D 470513

The entire description and all Tasks/Standards for the Automotive Maintenance and Light Repair Sections A, B, C, and D are listed in the Automotive Maintenance and Light Repair Section A.
Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.

Basic Automotive Electricity 470556

This course introduces the student to the principles, theories, and concepts of the automotive electrical system that include the unique diagramming, coding and locating of wiring, and component devices. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required for performing each task, including proper care and cleaning of customers' vehicles. 2. The instruction has included identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks. 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources. 4. In all areas, the student has demonstrated the ability to write work orders and warranty reports, to include information regarding problem resolution and the results of the work performed for the customer and manufacturer. The writing process will incorporate the "Three C's" (concern, cause and correction) as a format to communicate this information.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
2. Identify and interpret electrical/electronic system concern; determine necessary action.
3. Research applicable vehicle and service information such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.
4. Locate and interpret vehicle and major component identification numbers.
5. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).
6. Use wiring diagrams during diagnosis of electrical circuit problems.
7. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems including source voltage, voltage drop, current flow, and resistance.
8. Check electrical circuits with a test light; determine necessary action.
9. Check electrical circuits using fused jumper wires; determine necessary action.
10. Locate shorts, grounds, opens and resistance problems in electrical/electronic circuits; determine necessary action.
11. Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.
12. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
13. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action.
14. Remove and replace terminal end from connector; replace connectors and terminal ends.
15. Repair wiring harness (including CAN/BUS systems).
16. Perform solder repair of electrical wiring.
17. Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.

Co-op I (Auto) 470501

Co-op provides supervised on-the-job work experience related to the student's educational objectives. Students who participate in the Cooperative Education program receive compensation for their work.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply worksite and shop safety rules, and to apply OSHA regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Apply worksite and lab safety procedures.
2. Apply personal safety rules and procedures.
3. Apply fire prevention rules and procedures.
4. Obtain first aid certification.
5. Obtain CPR certification.
6. Demonstrate hazardous communications procedures.
7. Describe and demonstrate universal precautions procedures.

Light Vehicle Diesel Engines Section A 470527

These courses introduce the student to the principles, theories, and concepts of Light Vehicle Diesel Engines, and include instruction in General Engine Diagnosis, Cylinder Head and Valve Train Diagnosis and Repair, Engine Block Diagnosis and Repair, Lubrication and Cooling Systems Diagnosis and Repair, Air Induction and Exhaust Systems Diagnosis and Repair, and Fuel System Diagnosis and Repair. In all areas, appropriate theory, safety, and support instruction will be taught and required for performing each task, including proper care of customer's vehicles. The instruction will also include identification and use of appropriate tools and testing/measurement equipment required to accomplish certain tasks. The student will also receive the necessary training to locate and use current reference and training materials from accepted industry publications and resources, and demonstrate the ability to write work orders. Instructors who teach this course must have the ASE A9 Light Vehicle Diesel Engines Certification.

Prerequisite: Completion of all Automotive Maintenance and Light Repair Courses (Sections A, B, C, and D)

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. **GENERAL DIAGNOSIS:**
    a. Verify the complaint, and road/dyno test vehicle; review driver/customer concerns/expectations and vehicle service history (if available); determine further diagnosis.
    b. Record vehicle identification number (VIN). Identify engine model, calibration and serial numbers to research applicable vehicle and service information, service precautions, and technical service bulletins; determine needed actions.
    c. Perform scan tool check and visual inspection for physical damage and missing, modified, or tampered components; determine needed actions.
    d. Check and record electronic diagnostic codes, freeze frame and/or operational data; monitor scan tool data; determine further diagnosis.
    e. Clear diagnostic trouble codes (DTCs) and verify the repair.
    f. Inspect engine assembly and compartment for fuel, oil, coolant, exhaust, or other leaks; determine needed repairs.
    g. Inspect engine compartment wiring harness, connectors, seals, and locks; check for proper routing and condition; determine needed repairs.
    h. Listen for the isolate engine noises; determine needed repairs.
    i. Isolate and diagnose engine related vibration problems; determine needed actions.
    j. Check engine exhaust for abnormal odor and/or smoke color and volume; determine further diagnosis.
    k. Check fuel for contamination, quantity, quality, and consumption; determine needed actions.
    l. Perform crankcase pressure test; determine further diagnosis.

m. Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed actions.
n. Check cooling system for freeze point, level, contamination, condition, temperature, pressure, circulation, and fan operation; determine needed repairs.
o. Check lubrication system for contamination, oil level, temperature, pressure, filtration, and oil consumption; take oil sample and obtain oil analysis if needed; determine needed repairs.
p. Diagnose no-cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed actions.
q. Diagnose engine problems cause by battery condition, connections, or excessive key-off batter drain; determine needed repairs.
r. Diagnose engine problems resulting from an electrical undercharge, overcharge, or a no-chard condition; determine needed action.

2. **CYLINDER HEAD AND VALVE TRAIN DIAGNOSIS AND REPAIR:**
    a. Remove, inspect disassemble and clean cylinder heard assembly(s).
    b. Inspect threaded holes, studs, and bolts for serviceability; service/replace as needed.
    c. Measure cylinder head thickness, and check mating surfaces for flatness, corrosion, warpage and surface finish; inspect for cracks/damage; check condition of passages; inspect core and gallery plugs; determine serviceability and needed repairs.
    d. Inspect valves, guides, seats, springs, retainers, rotators, locks and seals; determine serviceability and needed repairs.
    e. Inspect and/or replace injector sleeves, glow plug sleeves, and seals; pressure test to verify repair (if applicable); measure injector tip, nozzle, or pre-chamber protrusion where specified by manufacturer.
    f. Inspect and/or replace valve bridges (crossheads) and guides; adjust bridges (crossheads) if applicable.
    g. Reassemble, check, and determine required cylinder head gasket thickness; install cylinder head assembly and gasket as specified by the manufacturer.
    h. Inspect pushrods, rocker arms, rocker arm shafts, electronic components, wiring harness, seals; repair/replace as needed.
    i. Inspect, install, and adjust cam followers, lash adjusters and retainers; adjust valve clearance if applicable.
    j. Inspect, measure, and replace/reinstall overhead camshaft and bearings; measure and adjust endplay.
    k. Inspect and time drive gear train components (includes gear, chain, and belt systems).
3. **ENGINE BLOCK DIAGNOSIS AND REPAIR:**
    a. Remove, inspect, service, and install pans, covers, ventilation systems, gaskets, seals, and wear rings.
    b. Disassemble, clean and inspect engine block for cracks; check mating surfaces and related components for damage or warpage and surface finish; check deck height; check condition of passages, core, and gallery plugs; inspect threaded holes, studs, dowel pins and bolts for serviceability; service/replace as needed.

c. Inspect and measure cylinder walls for war and damage; determine needed service.
d. Inspect in-block camshaft bearings for war and damage; replace as needed.
e. Inspect, measure, and replace/reinstall in-block camshaft; measure and correct end play; inspect, replace/reinstall, and adjust cam followers (if applicable).
f. Clean and inspect crankshaft and journals for surface finish, cracks, and damage; check condition of oil passages; check passage plugs; measure journal diameters; check mounting surfaces; determine needed service.
g. Determine the proper select-fit components such as pistons, connecting rod and main bearings.
h. Inspect and replace main bearings; check cap fit and bearing clearances; check and correct crankshaft end play.
i. Inspect, replace, verify, and adjust the drive gear train components (includes gear, chain, and belt systems).
j. Inspect, measure, or replace pistons, pins, and retainers.
k. Measure piston-to-cylinder wall clearance.
l. Identify piston, connecting rod bearing, and main bearing wear patterns that indicate connecting rod and crankshaft alignment or bearing bore problems; check bearing bore and bushing condition; determine needed repairs.
m. Check ring-to-groove fit and end gaps; install rings on pistons; assemble pistons and connecting rods and install in block; check piston height/protrusion; check liner height/protrusion (if applicable); replace rod bearings and check clearances; check condition, position, and clearance of piston cooling jets (nozzles).
n. Inspect crankshaft vibration damper; determine needed repairs.
o. Inspect flywheel/flexplate and/or dual-mass flywheel (including ring gear) and mounting surfaces for cracks, wear, and runout; determine needed repairs.

4. **LUBRICATION AND COOLING SYSTEMS DIAGNOSIS AND REPAIR:**
   a. Verify base engine oil pressure and check operation of pressure sensor/switch and pressure gauge; verify engine oil temperature and check operation of temperature sensor.
   b. Inspect, measure, repair/replace oil pump, housing, drives, pipes, and screens; check drive gear clearance.
   c. Inspect, repair/replace oil pressure regulator assembly including: housing, bore, spring, regulator valve(s), oil filter by-pass valve(s), and anti-drain back valve.
   d. Inspect, clean, test, and reinstall/replace oil cooler, by-pass valve, lines, and hoses.
   e. Inspect turbocharger lubrication and cooling systems; repair/replace as needed.
   f. Change engine oil and filters using proper type, viscosity, and rating per manufacturer specifications.
   g. Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.
   h. Verify coolant temperature; check operation of temperature and level sensors, switches, and temperature gauge.
   i. Inspect and replace thermostat(s), by-pass/passes, housing(s), and seal(s).
   j. Flush and refill cooling system; following manufacturer's specification, add proper coolant type; bleed air from system.

k. Inspect and replace water pump(s), housing(s), hoses, and idler pulley(s) or drive gear.
l. Inspect radiator(s), pressure cap(s), and tank(s); pressure test cooling system and radiator cap(s); determine needed repairs.
m. Inspect and repair/replace cooling fan, fan hub, fan clutch, controls, and shroud(s).

5. **AIR INDUCTION AND EXHAUST SYSTEMS DIAGNOSIS AND REPAIR:**
   a. Inspect and service/replace air induction piping, air cleaner, and element; determine needed actions.
   b. Perform intake manifold pressure test; inspect, test, clean, and/or replace charge air cooler and piping system; determine needed actions.
   c. Inspect test, and replace turbocharger(s) (including variable ratio/geometry VGT), pneumatic, hydraulic, vacuum, and electronic controls and actuators; inspect, test, and replace wastegate and wastegate controls.
   d. Inspect, test, and replace intake manifold(s), variable intake manifold(s), gaskets, actuators, temperature and pressure sensors, and connections.
   e. Perform exhaust back pressure and temperature tests; determine needed actions.
   f. Inspect and repair/replace exhaust manifold(s), gaskets, piping, mufflers, and mounting hardware.
   g. Inspect, test, and repair/replace preheater/inlet air heater and/or glow plug system and controls.
   h. Inspect, test, and replace exhaust after treatment system components and controls, including diesel oxidation catalyst (DOC), selective catalyst reduction (SCR), diesel exhaust fluid (DEF), diesel particulate filter (DPF); check regeneration system operation.
   i. Inspect, test, service, and replace EGR system components including EGR valve(s), EGR cooler by-pass valve(s), EGR cooler(s), piping, electronic sensors, actuators, controls, and wiring.
   j. Inspect, test, and replace airflow control (throttle) valve(s) and controls.
   k. Inspect, test, and replace crankcase ventilation system components, including sensors, filters, valves, and piping.

6. **FUEL SYSTEM DIAGNOSIS AND REPAIR:**
   a. Inspect, clean, test, and repair/replace fuel system tanks, vents, caps, mounts, valves, single/dual supply and return lines, and fittings.
   b. Inspect, clean, test, and repair/replace fuel transfer and/or supply pump, sensors, strainers, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates (if applicable), and mounting hardware.
   c. Check fuel system for air; determine needed repairs; prime and bleed fuel system; check and repair/replace primer pump.
   d. Inspect, test, and repair/replace low fuel pressure regulator supply and return systems, including low pressure switches.
   e. Inspect and reinstall/replace high-pressure injection lines, fittings, transfer tubes, seals, and mounting hardware.
   f. Inspect, adjust, and repair/replace electronic throttle and PTO control devices, circuits, and sensors.

g. Perform on-engine inspections, tests, and replace high pressure common rail fuel system components and electronic controls.
h. Perform on-engine inspections and test; replace hydraulic electronic unit injector(s) (HEUI) components and electronic controls.
i. Perform on-engine inspections and tests; replace pump-line nozzle fuel system (PLN-E) components and electronic controls.
j. Inspect and replace electrical connector terminals, pins, harnesses, seals, and locks.
k. Connect diagnostic scan tool to vehicle/engine; access, verify, and update software calibration settings, injector calibration codes; perform control module re-learn procedures as needed.
l. Use a diagnostic scan tool to inspect and test electronic engine control system, sensors, actuators, electronic control modules, and circuits; determine further diagnosis.
m. Measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM) or appropriate test equipment.
n. Diagnose engine problems resulting from failures of interrelated systems (for example: cruise control, security alarms/theft deterrent, transmission controls, exhaust after-treatment systems, electronic stability control, or non-OEM installed accessories.

Light Vehicle Diesel Engines Section B 470528

The entire description and all Tasks/Standards for the Light Vehicle Diesel Engines Sections A, B, C, and D are listed in the Light Vehicle Diesel Engines Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Light Vehicle Diesel Engines Section C 470529

The entire description and all Tasks/Standards for the Light Vehicle Diesel Engines Sections A, B, C, and D are listed in the Light Vehicle Diesel Engines Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Light Vehicle Diesel Engines Section D 470530

The entire description and all Tasks/Standards for the Light Vehicle Diesel Engines Sections A, B, C, and D are listed in the Light Vehicle Diesel Engines Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Master Automobile Service Technology Section A 470523

This advanced automotive course presents the theory, component identification, operation, diagnosis, and the service and repair of Engines and Engine Systems, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Automatic and Manual Transmissions/Transaxles, and Engine Performance Systems. In all areas, appropriate theory, safety, and support instruction will be taught and required for performing each task. The instruction will also include identification and use of appropriate tools and testing/measurement equipment required to accomplish certain tasks. The student will also locate and use current reference and training materials from accepted industry publications and resources and write industry standard work orders which include information regarding problem resolution and the results of the work performed. All tasks for Master Automobile Service Technology Sections A and B are listed here.

Prerequisite: Completion of all Automotive Service Technology courses and all Automotive Maintenance and Light Repair courses. Courses A and B can be taken in any sequence.

Recommended Grade Level: 12

Recommended Credit: 1

Students will:

1. **AUTOMATIC TRANSMISSION AND TRANSAXLE:**
    a. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action.
    b. Diagnose noise and vibration concerns; determine necessary action.
    c. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.
    d. Disassemble, clean, and inspect transmission/transaxle.
    e. Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, sleeves, retainers, brackets, check valves/balls, screens, spacers and gaskets).
    f. Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine necessary action.
    g. Assemble transmission/transaxle.
    h. Inspect, measure, and reseal oil pump assembly and components.
    i. Measure transmission/transaxle end play or preload; determine necessary action.
    j. Inspect, measure, and replace thrust washers and bearings.
    k. Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.
    l. Inspect bushings; determine necessary action.
    m. Inspect and measure planetary gear assembly components; determine necessary action.
    n. Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action.

o. Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action.
p. Inspect, measure, repair, adjust or replace transaxle final drive components.
q. Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates, bands and drums; determine necessary action.
r. Measure clutch pack clearance; determine necessary action.
s. Air test operation of clutch and servo assemblies.
t. Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, retainers; determine necessary action.

2. **MANUAL DRIVE TRAIN AND AXLES:**
   a. Diagnose noise concerns through the application of transmission/transaxle powerflow principles.
   b. Diagnose hard shifting and jumping out of gear concerns; determine necessary action.
   c. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action.
   d. Diagnose noise and vibration concerns; determine necessary action.
   e. Diagnose noise, slippage, and chatter concerns; determine necessary action.
   f. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage.
   g. Diagnose noise, vibration, and unusual steering concerns; determine necessary action.
   h. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.
   i. Disassemble, inspect clean, and reassemble internal transmission/transaxle components.
   j. Inspect ring gear and measure run out; determine necessary action.
   k. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings.
   l. Measure and adjust drive pinion depth.
   m. Measure and adjust drive pinion bearing preload.
   n. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).
   o. Check ring and pinion tooth contact patterns; perform necessary action.
   p. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.
   q. Reassemble and re-install differential case assembly; measure runout; determine necessary action.
   r. Measure rotating torque; determine necessary action.
   s. Disassemble, service, and reassemble transfer case and components.
3. **SUSPENSION AND STEERING:**
   a. Identify and interpret suspension and steering system concerns; determine necessary action.
   b. Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action.

4. **BRAKES:**
    a. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action.
    b. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action.
    c. Depressurize high-pressure components of an electronic brake control system.
    d. Bleed the electronic brake control system hydraulic circuits.
    e. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).
    f. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio).
    g. Inspect and replace wheel studs.
5. **ELECTRICAL/ELECTRONIC SYSTEMS:**
    a. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.
    b. Repair wiring harness (including CAN/BUS systems).
    c. Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action.
    d. Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action.
    e. Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems.
    f. Perform software transfers, software updates, or flash reprogramming on electronic modules.
6. **HEATING AND AIR CONDITIONING:**
    a. Diagnose temperature control problems in the heater/ventilation system; determine necessary action.
    b. Determine procedure to remove and re-install evaporator; determine required oil quantity.
    c. Remove, inspect, and re-install condenser; determine required oil quantity.
    d. Determine procedure to remove, inspect, and re-install heater core.
7. **ENGINE PERFORMANCE:**
    a. Diagnose the causes of emissions or drivability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data.
    b. Diagnose emissions or drivability concerns without stored diagnostic trouble codes; determine necessary action.
    c. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.
    d. Diagnose drivability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM installed accessories, or similar systems); determine necessary action.

e. Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action.
f. Diagnose emissions and drivability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action.
g. Diagnose emissions and drivability concerns caused by the evaporative emissions control system; determine necessary action.
h. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.
i. Test the operation of turbocharger/supercharger systems; determine necessary action.

8. **ENGINE REPAIR:**
   a. Inspect valve springs for squareness and free height comparison; determine necessary action.
   b. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine necessary action.
   c. Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action.
   d. Inspect valves and valve seats; determine necessary action.
   e. Check valve spring assembled height and valve stem height; determine necessary action.
   f. Inspect valve lifters; determine necessary action.
   g. Inspect and/or measure camshaft for runout, journal wear and lobe wear.
   h. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action.
   i. Disassemble engine block; clean and prepare components for inspection and reassembly.
   j. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action.
   k. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine necessary action.
   l. Deglaze and clean cylinder walls.
   m. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.
   n. Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine necessary action.
   o. Inspect main and connecting rod bearings for damage and wear; determine necessary action.
   p. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine necessary action.
   q. Inspect and measure piston skirts and ring lands; determine necessary action.
   r. Determine piston-to-bore clearance.
   s. Inspect, measure, and install piston rings.

t. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance or silencer); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.
u. Assemble engine block.
v. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action.

Master Automobile Service Technology Section B 470525

The entire description and all Tasks/Standards for the Master Automobile Service Technology Sections A, B, C, and D are listed in the Master Automobile Service Technology Section A.
Courses and Standards/Tasks in A and B can be completed in any sequence.

Precision Measurement 470546

This class introduces the student to the basic fundamentals of precision measurement and its application in the industrial setting.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Measure with an English fraction rule.
2. Measure with an English decimal rule.
3. Measure with a metric steel rule.
4. Read an English Vernier caliper and height gauge scale.
5. Read a metric Vernier caliper and height gauge scale.
6. Read an English micrometer.
7. Read a metric micrometer.
8. Assemble English gauge blocks to specified measurements.
9. Assemble metric gauge blocks to specified measurements.
10. Use hole and plug gauges to check hole diameters.
11. Use thread gauges to check thread dimensions.
12. Read and use various dial indicators.
13. Identify pneumatic, electrical, electronic, and optical comparators.

Shop Management 470301

This course introduces the basic principles of sound and efficient shop management. Inventory control, fiscal management, and customer relations are emphasized.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Maintain tools/equipment.
2. Develop customer relations skills.
3. Prepare work orders.
4. Maintain inventory.
5. Maintain service records.
6. Supervise personnel.
7. Prepare parts requisition.
8. Provide fiscal management.
9. Complete an incident report.

Special Problems I (Auto) 470577

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught to the student in previous Auto courses. The instructor will teach students how to deal with real world problems that arise when repairing automobiles subjected to various types of customer road use.

Prerequisites: Completion of the Automotive Maintenance and Light Repair Courses/Sections A, B, C and D.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Problems II (Auto) 470578

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught to the student in previous Auto courses. The instructor will teach students how to deal with real world problems that arise when repairing automobiles subjected to various types of customer road use.

Prerequisites: Completion of the Automotive Maintenance and Light Repair Courses/Sections A, B, C and D.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Problems III (Auto) 470579

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught to the student in previous Auto courses. The instructor will teach students how to deal with real world problems that arise when repairing automobiles subjected to various types of customer road use.

Prerequisites: Completion of the Automotive Maintenance and Light Repair Courses/Sections A, B, C and D.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Problems IV (Auto) 470584

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught to the student in previous Auto courses. The instructor will teach students how to deal with real world problems that arise when repairing automobiles subjected to various types of customer road use.

Prerequisites: Completion of the Automotive Maintenance and Light Repair Courses/Sections A, B, C and D.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

COLLISION REPAIR TECHNOLOGY CAREER PATHWAYS

Entry Level Collision Repair Painter CIP 47.0603.01

A program that prepares individuals to apply technical knowledge and skills to repair, reconstruct and finish automobile bodies, fenders, and external features. It includes instruction in damage repair, painting and refinishing techniques, and damage analysis and estimating.

Note: The courses listed in the Entry Level Collision Repair Painter Pathway also apply to schools using the **ICar** PDP-EE (Professional Development Program—Education Edition) Curriculum to teach the classes. The only exception for schools using the **ICar** Curriculum is that 470631 Introduction to Collision Repair is no longer an option, and must be chosen over any other option listed. Programs using the **ICar** PDP-EE (Professional Development Program—Education Edition) Curriculum are eligible to test their students with the **ICar** Refinish Pro-Level 1 Exam. This Exam will meet the Valid Industry Certification requirements for this pathway. Students passing this exam will receive an **ICar** Refinish Platinum 1 Status Certificate.

BEST PRACTICE COURSES

Complete (3.5) three and one half credits from the following:

- 470639 Painting and Refinishing I
- 470640 Painting and Refinishing II
- 470645 Painting and Refinishing III
- 470628 Damage Analysis, Estimating and Customer Service (.5 credit)

Complete (.5) one-half credit from the following:

- 470647 Painting and Refinishing Special Problems (.5 credit) **OR** 470631 Introduction to Collision Repair (.5 credit)

Entry Level Non-Structural Damage and Repair Technician CIP 47.0603.03

A program that prepares individuals to apply technical knowledge and skills to repair, reconstruct and finish automobile bodies, fenders, and external features. It includes instruction in damage repair, non-structural analysis, plastics and adhesives, and damage analysis and estimating.

Note: The courses listed in the Entry Level Non-Structural Damage and Repair Technician Pathway also apply to schools using the **ICar** PDP-EE (Professional Development Program—Education Edition) Curriculum to teach the classes. The only exception for schools using the **ICar** Curriculum is that 470631 Introduction to Collision Repair is no longer an option, and must be chosen over any other option listed. Programs using the **ICar** PDP-EE (Professional Development Program—Education Edition) Curriculum are eligible to test their students with the **ICar** Non-Structural Pro-Level 1 Exam. This Exam will meet the Valid Industry Certification requirements for this pathway. Students passing this exam will receive an **ICar** Non-Structural Platinum 1 Status Certificate.

BEST PRACTICE COURSES

Complete (4) four credits from the following:

- 470633 Non-Structural Analysis and Damage Repair I
- 470644 Non-Structural Analysis and Damage Repair II
- 470649 Non-Structural Analysis and Damage Repair III
- 470628 Damage Analysis, Estimating and Customer Service (.5 credit)
- 470651 Non-Structural Analysis and Damage Repair Special Projects (.5 credit) **OR** 470631 Introduction to Collision Repair (.5 credit)

COLLISION REPAIR TECHNOLOGY COURSES

Collision Repair Internship I 470604

Internship for CTE courses provides supervised worksite experience for high school students who are enrolled in a capstone course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester or long and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less).

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Damage Analysis, Estimating and Customer Service 470628

This course instructs students on how to perform damage analysis, estimating and providing quality Customer Service. For every task in Damage Analysis, Estimating and Customer Service, the following safety requirement must be strictly enforced: comply with personal and environmental safety practices associated with clothing and the use of gloves, respiratory protection, eye protection, hand tools, power equipment, proper ventilation and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Recommended Grade Level: 11 - 12

Recommended Credit: .5

Students will:

1. Position the vehicle for inspection.
2. Prepare vehicle for inspection by providing access to damaged areas.
3. Analyze damage to determine appropriate methods for overall repairs.
4. Determine the direction, point(s) of impact, and extent of direct, indirect, and inertia damage.
5. Gather details of the incident/accident necessary to determine the full extent of vehicle damage.
6. Identify and record pre-existing damage.
7. Identify and record prior repairs.
8. Perform visual inspection of structural components and members.
9. Identify structural damage using measuring tools and equipment.
10. Perform visual inspection of non-structural components and members.
11. Determine parts, components, material type(s) and procedures necessary for a proper repair.
12. Identify type and condition of finish; determine if refinishing is required.
13. Identify suspension, electrical and mechanical component physical damage.
14. Identify safety systems physical damage.
15. Identify interior component damage.
16. Identify damage to add-on accessories and modifications.
17. Identify single (one time) use components.
18. Determine and record customer/vehicle owner information.
19. Identify and record vehicle identification number (VIN) information, including nation of origin, make, model, restraint system, body type, production date, engine type, and assembly plant.
20. Identify and record vehicle options, including trim level, paint code, transmission, accessories, and modifications.
21. Identify safety systems; determine replacement items.
22. Apply appropriate estimating and parts nomenclature (terminology).
23. Determine and apply appropriate estimating sequence.
24. Utilize estimating guide procedure pages.
25. Apply estimating guide footnotes and headnotes as needed.

26. Estimate labor value for operations requiring judgment.
27. Select appropriate labor value for each operation (structural, non-structural, mechanical, and refinish).
28. Select and price OEM parts; verify availability, compatibility, and condition.
29. Select and price alternative/optional OEM parts; verify availability, compatibility and condition.
30. Select and price aftermarket parts; verify availability, compatibility, and condition.
31. Select and price recyclable/used parts; verify availability, compatibility and condition.
32. Select and price re-manufactured, rebuilt, and reconditioned parts; verify availability, compatibility and condition.
33. Determine price and source of necessary sublet operations.
34. Determine labor value, prices, charges, allowances, or fees for non-included operations and miscellaneous items.
35. Recognize and apply overlap deductions, included operations, and additions.
36. Determine additional material and charges.
37. Determine refinishing material and charges.
38. Apply math skills to establish charges and totals.
39. Interpret computer-assisted and manually written estimates; verify the information is current.
40. Identify procedural differences between computer-assisted systems and manually written estimates.
41. Identify procedures to restore corrosion protection; establish labor values, and material charges.
42. Determine the cost effectiveness of the repair and determine the approximate vehicle retail and repair value.
43. Recognize the differences in estimation procedures when using different information provider systems.
44. Verify accuracy of estimate compared to the actual repair and replacement operations.
45. Identify type of vehicle construction (space frame, unibody, body-over-frame).
46. Recognize the different damage characteristics of space frame, unibody, and body-over-frame vehicles.
47. Identify impact energy absorbing components.
48. Identify steel types; determine repair ability.
49. Identify aluminum/magnesium components; determine repair ability.
50. Identify plastic/composite components; determine repair ability.
51. Identify vehicle glass components and repair/replacement procedures.
52. Identify add-on accessories.
53. Acknowledge and/or greet customer/client.
54. Listen to customer/client; collect information, identify customer/client concerns, needs, and expectations.
55. Establish cooperative attitude with customer/client.
56. Identify yourself to customer/client; offer assistance.
57. Deal with angry customer/client.
58. Identify customer/client preferred communication method; follow up to keep customer/client informed about parts and the repair process.
59. Recognize basic claims handling procedures; explain to customer/client.

60. Project positive attitude and professional appearance.
61. Provide and review warranty information.
62. Provide and review technical and consumer protection information.
63. Estimate and explain duration of out-of-service time.
64. Apply negotiation skills to obtain a mutual agreement.
65. Interpret and explain manual or computer-assisted estimate to customer/client.

Industrial Safety 499930

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply worksite and shop safety rules, and to apply OSHA regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Apply worksite and lab safety procedures.
2. Apply personal safety rules and procedures.
3. Apply fire prevention rules and procedures.
4. Obtain first aid certification.
5. Obtain CPR certification.
6. Demonstrate hazardous communications procedures.
7. Describe and demonstrate universal precautions procedures.

Introduction to Collision Repair 470631

This course introduces the student to safety, sanding, grinding, pulling, roughing and filling; the use of tools and equipment; and preparing and priming automotive panels through lectures and demonstrations.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Review damage report and analyze damage to determine appropriate methods for overall repair; develop repair plan.
2. Inspect, remove, store, and replace exterior trim and moldings.
3. Protect panels, glass interior parts, and other vehicles adjacent to the repair area.
4. Soap and water wash entire vehicle for inspection.
5. Remove the paint from the damaged area of a body panel.
6. Locate and repair surface irregularities on a damaged body panel.
7. Heat shrink stretched panel areas to proper contour.
8. Mix and apply body filler.
9. Rough sand cured body filler to contour; finish sand.
10. Mix primer, primer-surfacer, or primer-sealer.
11. Apply primer onto surface of prepared area.
12. Dry or wet sand areas to which primer surface has been applied.
13. Clean area to be refinished using a final cleaning solution.

Mechanical and Electrical Components I 470642

These courses provide instruction in the diagnosis, repair and/or replacement of suspension, steering, electrical, brake, drive train, fuel, exhaust, and restraint systems. They will be taught by demonstration and lecture. The theories and concepts of heating and air conditioning systems will also be discussed and demonstrated. These courses provide practical experience in the inspection and repair or replacement of suspension and steering systems. They will be taught by demonstration and hands-on experience. The skills required are most effectively taught and practiced on live work. Due to the unpredictable nature of live work, some tasks may carry over to other courses.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Perform visual inspection and measuring checks to identify steering and suspension collision damage.
2. Identify one-time use fasteners.
3. Clean, inspect, and prepare reusable fasteners.
4. Remove, replace, inspect or adjust power steering pump, pulleys, belts, hoses, fittings and pump mounts.
5. Remove and replace power steering gear (non-rack and pinion type).
6. Inspect, remove, and replace power rack and pinion steering gear and related components.
7. Inspect and replace parallelogram steering linkage components.
8. Inspect, remove and replace upper and lower control arms and related components.
9. Inspect, remove and replace steering knuckle/spindle/hub assemblies (including bearings, races, and seals).
10. Inspect, remove and replace front suspension system coil springs and spring insulators (silencers).
11. Inspect, remove, replace, and adjust suspension system torsion bars, and inspect mounts.
12. Inspect, remove and replace stabilizer bar bushings, brackets, and links.
13. Inspect, remove and replace MacPherson strut cartridge or assembly, upper bearing, and mount.
14. Inspect, remove, and replace rear suspension system transverse links, control arms, stabilizer bars, bushings, and mounts.
15. Inspect, remove, and replace suspension system leaf spring(s) and related components.
16. Inspect axle assembly for damage and misalignment.
17. Inspect, remove and replace shock absorbers.
18. Diagnose, inspect, adjust, repair or replace active suspension systems and associated lines and fittings.
19. Measure vehicle ride height and wheel base; determine needed repairs.

20. Inspect, remove, replace, and align front and rear frame (cradles/sub).
21. Diagnose and inspect steering wheel, steering column, and components.
22. Verify proper operation of steering system.
23. Diagnose front and rear suspension system noises and body sway problems; determine needed repairs.
24. Diagnose vehicle wandering, pulling, hard steering, bump steer, memory steering, torque steering, and steering return problems; determine needed repairs.
25. Demonstrate an understanding of suspension and steering alignments (caster, camber, toe, SAI).
26. Diagnose tire wear patterns; determine needed repairs.
27. Inspect tires; identify direction of rotation and location; check tire size, tire pressure monitoring system (TPM) and adjust air pressure.
28. Diagnose wheel/tire vibration, shimmy, tire pull (lead), wheel hop problems; determine needed repairs.
29. Measure wheel, tire, axle, and hub runout; determine needed repairs.
30. Reinstall wheels and torque lug nuts.
31. Check for available voltage, voltage drop and current in electrical wiring circuits and components with a DMM (digital multimeter).
32. Repair electrical circuits, wiring, and connectors.
33. Inspect, test, and replace fusible links, circuit breakers, and fuses.
34. Perform battery state-of-charge test and slow/fast battery charge.
35. Inspect, clean, repair or replace battery, battery cables, connectors and clamps.
36. Dispose of batteries and battery acid according to local, state, and federal requirements.
37. Identify programmable electrical/electronic components and check for malfunction indicator lamp (MIL); record data for reprogramming before disconnecting battery.
38. Inspect alignment, adjust, remove and replace alternator (generator), drive belts, pulleys, and fans.
39. Check operation and aim headlamp assemblies and fog/driving lamps. Determine needed repairs.
40. Inspect, test, and repair or replace switches, relays, bulbs, sockets, connectors, and wires of interior and exterior light circuits.
41. Remove and replace horn(s); check operation.
42. Check operation of wiper/washer systems; determine needed repairs.
43. Check operation of power side and tailgate window; determine needed repairs.
44. Inspect, remove and replace power seat, motors, linkages, and cables.
45. Inspect, remove and replace components of electric door and hatch/trunk lock.
46. Inspect, remove and replace components of keyless lock/unlock devices and alarm systems.
47. Inspect, remove and replace components of electrical sunroof and convertible/retractable hard top.
48. Check operation of electrically heated mirrors, windshields, back lights, and panels; determine needed repairs.
49. Demonstrate the proper self-grounding procedures for handling electronic components.
50. Check for module communication errors using a scan tool.
51. Use wiring diagrams and diagnostic flow charts during diagnosis of electrical circuit problems.

52. Demonstrate safe disarming techniques of high voltage systems on hybrid vehicles.
53. Identify potential safety and environmental concerns associated with hybrid vehicle systems.
54. Inspect brake lines, hoses, and fittings for leaks, dents, kinks, rust, cracks or wear; tighten fittings and supports; replace brake lines (double flare and ISO types), hoses, fittings, seals, and supports.
55. Identify, handle, store, and install appropriate brake fluids; dispose of in accordance with federal, state, and local regulations.
56. Bleed (manual, pressure, vacuum or surge) hydraulic brake system.
57. Pressure test brake hydraulic system; determine needed repair.
58. Adjust brake shoes; remove and reinstall brake drums or drum/hub assemblies and wheel bearings.
59. Remove, clean and inspect caliper and rotor assembly and mountings for wear and damage; reinstall.
60. Check parking brake system operation.
61. Identify the proper procedures for handling brake dust.
62. Check for bent or damaged brake system components.
63. Demonstrate an understanding of various types of advanced braking systems (ABS, hydraulic, electronic, traction and stability control).
64. Identify and comply with environmental concerns relating to refrigerants and coolants.
65. Maintain and verify correct operation of certified refrigerant recovery and recharging equipment.
66. Locate and identify A/C system service ports.
67. Identify, recover, label and store refrigerant from A/C system.
68. Recycle refrigerant in accordance with EPA regulations.
69. Evacuate and recharge A/C system; check for leaks.
70. Identify oil type and maintain correct amount in A/C system.
71. Inspect, adjust, and replace A/C compressor drive belts; check pulley alignment.
72. Remove and replace A/C compressor; inspect, repair or replace A/C compressor mount.
73. Inspect, repair or replace A/C system mufflers, hoses, lines, fittings, orifice tube, expansion valve, and seals.
74. Inspect, test, and replace A/C system condenser and mounts.
75. Inspect and replace receiver/drier or accumulator/drier.
76. Inspect and repair A/C component wiring.
77. Demonstrate an understanding of safe handling procedures associated with high voltage A/C compressors and wiring.
78. Check engine cooling and heater system hoses and belts; determine needed repairs.
79. Inspect, test, remove, and replace radiator, pressure cap, coolant recovery system, and water pump.
80. Recover, refill, and bleed system with proper coolant and check level of protection; leak test system and dispose of materials in accordance with EPA specifications.
81. Remove, inspect and replace fan (both electrical and mechanical), fan sensors, fan pulley, fan clutch, and fan shroud; check operation.
82. Inspect, remove, and replace auxiliary oil/fluid coolers; check oil levels.
83. Demonstrate an understanding of hybrid cooling systems.
84. Remove, replace, and adjust shift or clutch linkage as required.

85. Remove, replace, and adjust cables or linkages for throttle valve (TV), kickdown, and accelerator pedal.
86. Remove and replace electronic sensors, wires, and connectors.
87. Remove and replace powertrain assembly; inspect, replace, and align powertrain mounts.
88. Remove and replace drive axle assembly.
89. Inspect, remove and replace half shafts and axle constant velocity (CV) joints.
90. Inspect, remove and replace drive shafts and universal joints.
91. Demonstrate an understanding of safe handling procedures associated with high voltage powertrain components.
92. Inspect, remove and replace exhaust pipes, mufflers, converters, resonators, tail pipes, and heat shields.
93. Inspect, remove and replace fuel tank, tank filter, cap, filler hose, pump/sending unit and inertia switch; inspect and replace fuel lines and hoses.
94. Inspect, remove and replace engine components of air intake systems.
95. Inspect, remove and replace canister, filter, vent, and purge lines of fuel vapor (EVAP) control systems.
96. Identify vehicle manufacturer's SRS recommended procedures before inspecting or replacing components.
97. Inspect, remove, and replace seatbelt and shoulder harness assembly and components.
98. Inspect restraint system mounting areas for damage; repair as needed.
99. Verify proper operation of seatbelt.
100. Deactivate and reactivate Supplemental Restraint System (SRS).
101. Inspect, remove and replace Supplemental Restraint System (SRS) sensors and wiring; ensure sensor orientation.
102. Verify that Supplemental Restraint System (SRS) is operational.
103. Inspect, remove, replace and dispose of deployed and non-deployed airbag(s) and pretensioners.
104. Use Diagnostic Trouble Codes (DTC) to diagnose and repair the Supplemental Restraint System (SRS).
105. Demonstrate an understanding of advanced restraint systems.

Mechanical and Electrical Components II 470653

The entire description and all Tasks/Standards for the Mechanical and Electrical Components II are listed in the Mechanical and Electrical Components I.

Non-Structural Analysis and Damage and Repair Special Projects 470651

This course gives instruction and provides practical experience in replacing and aligning bolts on automotive parts such as doors, hoods, and fenders; as well as instruction on the repair and replacement of non-structural weld-on automotive panels by aligning, welding, cutting and drilling through demonstrations and lectures. It will be taught by demonstration and hands-on practice. The skills required are most effectively taught and practiced on live work. Due to the unpredictable nature of live work, some tasks may carry over to other courses.

Prerequisite: Consent of instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Non-Structural Analysis and Damage and Repair Special Projects Lab 470652

This course provides practical experience in replacing and alignment of bolts on automotive parts such as doors, hoods, and fenders. It will be taught by demonstration and hands-on practice. The skills required are most effectively taught and practiced on live work. Due to the unpredictable nature of live work, some tasks may carry over to other courses.

Prerequisite: Consent of instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Non-Structural Analysis and Damage Repair I 470633

These courses give instruction and provide practical experience in replacing and aligning bolts on automotive parts such as doors, hoods, and fenders; as well as instruction on the repair and replacement of non-structural weld-on automotive panels by aligning, welding, cutting, and drilling through demonstrations and lectures. They will be taught by demonstration and hands-on practice. The skills required are most effectively taught and practiced on live work. Due to the unpredictable nature of live work, some tasks may carry over to other courses. For every task in Non-Structural Analysis and Damage Repair (Body Components), the following safety requirement must be strictly enforced: comply with personal and environmental safety practices associated with clothing and the use of gloves, respiratory protection, eye protection, hearing protection, hand tools, power equipment, proper ventilation, and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle manufacturer's SRS types, locations and recommended procedures before inspecting or replacing components.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan.
2. Inspect, remove, label, store, and reinstall exterior trim and moldings.
3. Inspect, remove, label, store, and reinstall interior trim and components.
4. Inspect, remove, label, store, and reinstall body panels and components that may interfere with or be damaged during repair.
5. Inspect, remove, label, store, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair.
6. Protect panels, glass, interior parts, and other vehicles adjacent to the repair area.
7. Soap and water wash entire vehicle and complete pre-repair inspection checklist.
8. Prepare damaged area using water-based and solvent-based cleaners.
9. Remove corrosion protection, undercoatings, sealers, and other protective coatings as necessary to perform repairs.
10. Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair.
11. Determine the extent of direct and indirect/hidden damage and direction of impact; develop and document a repair plan.
12. Inspect, remove and replace bolted, bonded, and welded steel panel or panel assemblies.
13. Determine the extent of damage to aluminum body panels; repair or replace.
14. Inspect, remove, replace, and align hood, hood hinges, and hood latch.
15. Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.
16. Inspect, remove, replace, and align doors, latches, hinges, and related hardware.
17. Inspect, remove, replace and align tailgates, hatches, liftgates and sliding doors.
18. Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware.

19. Inspect, remove, replace and align fenders, and related panels.
20. Straighten contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pulling attachments.
21. Weld damaged or torn steel body panels; repair broken welds.
22. Restore corrosion protection.
23. Replace door skins.
24. Restore sound deadeners and foam materials.
25. Perform panel bonding and weld bonding.
26. Diagnose and repair water leaks, dust leaks, and wind noise.
27. Identify one-time use fasteners.
28. Remove paint from the damaged area of a body panel.
29. Locate and repair surface irregularities on a damaged body panel.
30. Demonstrate hammer and dolly techniques.
31. Heat shrink stretched panel areas to proper contour.
32. Cold shrink stretched panel areas to proper contour.
33. Prepare and apply body filler.
34. Identify different types of body fillers.
35. Rough sand body filler to contour; finish sand.
36. Determine the proper metal finishing techniques for aluminum.
37. Determine proper application of body filler to aluminum.
38. Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.
39. Inspect, adjust, repair, remove, reinstall or replace weather-stripping.
40. Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.
41. Inspect, remove, reinstall, and align convertible top and related mechanisms.
42. Initialize electrical components as needed.
43. Identify weldable and non-weldable substrates used in vehicle construction.
44. Weld and cut high-strength steel and other steels.
45. Weld and cut aluminum.
46. Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation.
47. Set up and adjust the GMAW (MIG) welder to “tune” for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded.
48. Store, handle, and install high-pressure gas cylinders.
49. Determine work clamp (ground) location and attach.
50. Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.
51. Protect adjacent panels, glass, and vehicle interior from welding and cutting operations.
52. Protect computers and other electronic control modules during welding procedures.
53. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required.
54. Determine the joint type (butt weld with backing, lap) for weld being made.
55. Determine the type of weld (continuous, stitch weld, plug) for each specific welding operation.
56. Perform the following welds: continuous, plug, butt weld with and without backing, fillet.

57. Perform visual and destructive tests on each weld type.
58. Identify the causes of various welding defects; make necessary adjustments.
59. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.
60. Identify cutting process for different substrates and locations; perform cutting operation.
61. Identify different methods of attaching non-structural components (squeeze type resistant spot welds (STRSW), riveting, non-structural adhesive, silicon bronze).
62. Identify the types of plastics; determine repair ability.
63. Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures.
64. Repair rigid, semi-rigid, or flexible plastic panels.
65. Remove or repair damaged areas from rigid exterior composite panels.
66. Replace bonded rigid exterior composite body panels; straighten or align panel supports.

Non-Structural Analysis and Damage Repair II 470644

The entire description and all Tasks/Standards for the Non-Structural Damage Repair II are listed in the Non-Structural Damage Repair I.

Non-Structural Analysis and Damage Repair III 470649

The entire description and all Tasks/Standards for the Mechanical and Electrical Components II are listed in the Mechanical and Electrical Components I. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Painting and Refinishing I 470639

These courses provide instruction in the use of lacquer, acrylic enamel and base coat/clear coat refinishing products, masking procedures, preparations and paint problems. They will be taught by demonstration and lecture. The skills required are most effectively taught and practiced on live work. Due to the unpredictable nature of live work, some tasks may carry over to other courses. For every task in Painting and Refinishing, the following safety requirement must be strictly enforced: comply with personal and environmental safety practices associated with clothing and the use of gloves, respiratory protection, eye protection, hand tools, power equipment, proper ventilation, and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.
2. Identify safety and personal health hazards according to OSHA guidelines and the "Right to Know Law."
3. Inspect spray environment and equipment to ensure compliance with federal, state, and local regulations, and for safety and cleanliness hazards.
4. Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.
5. Select and use a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.
6. Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection).
7. Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation.
8. Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.
9. Inspect and identify substrate, type of finish, surface condition, and film thickness; develop and document a plan for refinishing using a total product system.
10. Strip paint to bare substrate (paint removal).
11. Dry or wet sand areas to be refinished.
12. Featheredge damaged areas to be refinished.
13. Apply suitable metal treatment or primer in accordance with total product systems.
14. Mask and protect other areas that will not be refinished.
15. Mix primer, primer-surfacer or primer-sealer.
16. Identify a complimentary color or shade of undercoat to improve coverage.
17. Apply primer onto surface of repaired area.
18. Apply two-component finishing filler to minor surface imperfections.

19. Block sand area to which primer-surfacer has been applied.
20. Dry sand area to which finishing filler has been applied.
21. Remove dust from area to be refinished, including cracks or moldings of adjacent areas.
22. Clean area to be refinished using a final cleaning solution.
23. Remove, with a tack rag, any dust or lint particles from the area to be refinished.
24. Apply suitable sealer to the area being refinished.
25. Scuff sand to remove nibs or imperfections from a sealer.
26. Apply stone chip resistant coating.
27. Restore caulking and seam sealers to repaired areas.
28. Prepare adjacent panels for blending.
29. Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials, preparation, and refinishing procedures.
30. Identify metal parts to be refinished; determine the materials, preparation, and refinishing procedures.
31. Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).
32. Select spray gun setup (fluid needle, nozzle, and cap) for product being applied.
33. Test and adjust spray gun using fluid, air and pattern control valves.
34. Demonstrate an understanding of the operation of pressure spray equipment.
35. Identify color code by manufacturer's vehicle information label.
36. Shake, stir, reduce, catalyze/activate, and strain refinish materials.
37. Apply finish using appropriate spray techniques (gun arc, gun angle, gun distance, gun speed, and spray pattern overlap) for the finish being applied.
38. Apply selected product on test and let-down panel; check for color match.
39. Apply single stage topcoat.
40. Apply basecoat/clearcoat for panel blending or panel refinishing.
41. Apply basecoat/clearcoat for overall refinishing.
42. Remove nibs or imperfections from basecoat.
43. Refinish rigid or semi-rigid plastic parts.
44. Refinish flexible plastic parts.
45. Apply multi-stage coats for panel blending or overall refinishing.
46. Identify and mix paint using a formula.
47. Identify poor hiding colors; determine necessary action.
48. Tint color using formula to achieve a blendable match.
49. Identify alternative color formula to achieve a blendable match.
50. Identify the materials equipment and preparation differences between solvent and waterborne technologies.
51. Identify blistering (raising of the paint surface, air entrapment); determine the cause(s) and correct the condition.
52. Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition.
53. Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition.
54. Identify lifting; determine the cause(s) and correct the condition.
55. Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition.

56. Identify orange peel; determine the cause(s) and correct the condition.
57. Identify overspray; determine the cause(s) and correct the condition.
58. Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition.
59. Identify sags and runs in paint surface; determine the cause(s) and correct the condition.
60. Identify sanding marks or sandscratch swelling; determine the cause(s) and correct the condition.
61. Identify contour mapping/edge mapping while finish is drying; determine the cause(s) and correct the condition.
62. Identify color difference (off-shade); determine the cause(s) and correct the condition.
63. Identify tape tracking; determine the cause(s) and correct the condition.
64. Identify low gloss condition; determine the cause(s) and correct the condition.
65. Identify poor adhesion; determine the cause(s) and correct the condition.
66. Identify paint cracking (shrinking, splitting, crowsfeet or line-checking, micro-checking); determine the cause(s) and correct the condition.
67. Identify corrosion; determine the cause(s) and correct the condition.
68. Identify dirt or dust in the paint surface; determine the cause(s) and correct the condition.
69. Identify water spotting; determine the cause(s) and correct the condition.
70. Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.
71. Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition.
72. Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition.
73. Identify chalking (oxidation); determine the cause(s) and correct the condition.
74. Identify bleed-through (staining); determine the cause(s) and correct the condition.
75. Identify pin-holing; determine the cause(s) and correct the condition.
76. Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition.
77. Identify pigment flotation (color change through film build); determine the cause(s) and correct the condition.
78. Apply decals, transfers, tapes, woodgrains, and pinstripes (painted and taped).
79. Buff and polish finish to remove defects as required.
80. Clean interior, exterior, and glass.
81. Clean body openings (door jambs and edges).
82. Remove overspray.
83. Perform vehicle clean-up; complete quality control using a checklist.

Painting and Refinishing II 470640

The entire description and all Tasks/Standards for the Painting and Refinishing II are listed in the Painting and Refinishing I.

Painting and Refinishing III 470645

The entire description and all Tasks/Standards for the Painting and Refinishing III are listed in the Painting and Refinishing I.

Painting and Refinishing Special Problems 470647

This course is designed for students to help them satisfactorily complete collision repair tasks or to enhance their skills in the occupational area.

Prerequisite: Consent of Instructor

Recommended Grade Level: 11 - 12

Recommended Credit: .5

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Projects I (Collision Repair) 470677

These courses are designed for students to help them satisfactorily complete collision repair tasks or to enhance their skills in the occupational area.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Projects II (Collision Repair) 470678

These courses are designed for students to help them satisfactorily complete collision repair tasks or to enhance their skills in the occupational area.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Projects III (Collision Repair) 470679

These courses are designed for students to help them satisfactorily complete collision repair tasks or to enhance their skills in the occupational area.

Prerequisite: Consent of Instructor

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Structural Analysis and Damage Repair I 470620

These courses present instruction on the analysis, repair and replacement of structural panels on unibody automobiles and body and frame alignment on unibody and frame cars. They will be taught by demonstration and lecture. The skills required are most effectively taught and practiced on live work. Due to the unpredictable nature of live work, some tasks may carry over to other courses. For every task in Structural Analysis and Damage Repair, the following safety requirement must be strictly enforced: comply with personal and environmental safety practices associated with clothing and the use of gloves, respiratory protection, eye protection, hand tools, power equipment, proper ventilation, and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle manufacturer's SRS types, locations and recommended procedures before inspecting or replacing components.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Measure and diagnose structural damage using a tram gauge.
2. Attach vehicle to anchoring devices.
3. Analyze, straighten and align mash (collapse) damage.
4. Analyze, straighten and align sag damage.
5. Analyze, straighten and align sidesway damage.
6. Analyze, straighten and align twist damage.
7. Analyze, straighten and align diamond frame damage.
8. Remove and replace damaged structural components.
9. Restore corrosion protection to repaired or replaced frame areas.
10. Analyze and identify misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and wheel alignment problems.
11. Align or replace misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and wheel alignment problems.
12. Identify or repair heat limitations and monitoring procedures for structural components.
13. Demonstrate an understanding of structural foam applications.
14. Measure and diagnose structural damage using a three-dimensional measuring system (mechanical, electronic, laser).
15. Measure and diagnose structural damage to vehicles using a dedicated (fixture) measuring system.
16. Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.
17. Analyze and identify crush/collapse zones.
18. Restore mounting and anchoring locations.
19. Analyze and identify misaligned or damaged steering, suspension, and power train components that can cause vibration, steering, and chassis alignment problems.
20. Realign or replace misaligned or damaged steering, suspension, and power train components that can cause vibration, steering and chassis alignment problems.

21. Measure and diagnose unibody damage using tram gauge.
22. Determine and inspect the locations of all suspension, steering, and power train component attaching points on the vehicle.
23. Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system.
24. Diagnose and measure unibody vehicles using a three-dimensional measuring system (mechanical, electronic, and laser).
25. Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair.
26. Attach anchoring devices to vehicle; remove or reposition components as necessary.
27. Straighten and align cowl assembly.
28. Straighten and align roof rails/headers and roof panels.
29. Straighten and align hinge and lock pillars.
30. Straighten and align vehicle openings, floor pans, and rocker panels.
31. Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/power train mounting points).
32. Straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points).
33. Identify substrate and repair or replacement recommendations.
34. Identify proper cold stress relief methods.
35. Repair damage using power tools and hand tools to restore proper contours and dimensions.
36. Remove and replace damaged sections of steel body structures.
37. Determine the extent of damage to aluminum structural components; repair, weld, or replace.
38. Analyze and identify crush/collapse zones.
39. Restore mounting and anchoring locations.
40. Remove and reinstall or replace fixed glass (heated and non-heated) using recommended materials and techniques.
41. Remove and reinstall ore replace modular glass using recommended materials.
42. Check for water leaks, dust leaks, and wind noise.
43. Identify weldable and non-weldable substrates used in vehicle construction.
44. Weld and cut high-strength steel and other steels.
45. Weld and cut aluminum.
46. Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation.
47. Set up and adjust the GMAW (MIG) welder to “tune” for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded.
48. Store, handle, and install high-pressure gas cylinders.
49. Determine work clamp (ground) location and attach.
50. Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.
51. Protect adjacent panels, glass, and vehicle interior from welding and cutting operations.
52. Protect computers and other electronic control modules during welding procedures.
53. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, clamp or tack as required.
54. Determine the joint type (butt weld with backing, lap) for weld being made.

55. Determine the type of weld (continuous, stitch weld, plug) for each specific welding operation.
56. Perform the following welds: continuous, plug, butt weld with and without backing, and fillet.
57. Perform visual and destructive tests on each weld type.
58. Identify the causes of various welding defects; make necessary adjustments.
59. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.
60. Identify cutting process for different substrates and locations; perform cutting operation.
61. Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, silicon bronze).

Structural Analysis and Damage Repair II 470622

The entire description and all Tasks/Standards for the Structural Analysis and Damage Repair II are listed in the Structural Analysis and Damage Repair I.

DIESEL/MEDIUM-HEAVY TRUCK TECHNOLOGY CAREER PATHWAYS

Diesel Brake Repairer CIP 47.0605.01

A program that prepares individuals to apply technical knowledge and skills to repair, service, and maintain diesel engines in vehicles such as automobiles, buses, ships, trucks, railroad locomotives, and construction equipment; as well as stationary diesel engines in electrical generators and related equipment.

Option only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Pathway will be phased out 6/30/2023.

BEST PRACTICE COURSES

Complete (4) four credits from the following:

- 470422 Brakes (Diesel)
- 470556 Basic Automotive Electricity **OR** 470477 Special Problems I (Diesel)
- 470425 Electrical Systems for Diesel Equipment
- 470406 Mechanical Concepts (.5 credit) **AND** 470403 Preventive Maintenance Lab (.5 credit)

Diesel Engine/Electrician Technician CIP 47.0605.02

A program that prepares individuals to apply technical knowledge and skills to repair, service, and maintain diesel engines in vehicles such as automobiles, buses, ships, trucks, railroad locomotives, and construction equipment; as well as stationary diesel engines in electrical generators and related equipment.

Option only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Pathway will be phased out 6/30/2023.

BEST PRACTICE COURSES

Complete (2) two credits from the following as prerequisite to the pathway:

- 470406 Mechanical Concepts (.5 credit) **AND** 470403 Preventive Maintenance Lab (.5 credit)
- 470556 Basic Automotive Electricity **OR** 470477 Special Problems I (Diesel)

Complete (3) three credits from the following:

- 470425 Electrical Systems for Diesel Equipment
- 470421 Introduction to Diesel Engines
- 470423 Diesel Engine Repair

Diesel Front End Technician CIP 47.0605.03

A program that prepares individuals to apply technical knowledge and skills to repair, service, and maintain diesel engines in vehicles such as automobiles, buses, ships, trucks, railroad locomotives, and construction equipment; as well as stationary diesel engines in electrical generators and related equipment.

Option only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Pathway will be phased out 6/30/2023.

BEST PRACTICE COURSES

Complete (4) four credits from the following:

- 470556 Basic Automotive Electricity and Lab **OR** 470477 Special Problems I (Diesel)
- 470425 Electrical Systems for Diesel Equipment
- 470424 Steering and Suspension (Diesel)
- 470406 Mechanical Concepts (.5 credit)
- 470403 Preventive Maintenance Lab (.5 credit)

Diesel Medium Heavy Truck Inspection, Maintenance, and Minor Repair Technician CIP 47.0605.07

This program introduces the student to the tasks/standards included in Inspection, Maintenance, and Minor Repair. The tasks included in the Inspection, Maintenance, and Minor Repair option are entry-level technician inspection tasks designed to introduce the student to correct procedures and practices of vehicle inspection in a teaching/learning environment. These courses will instruct the student in the principles, theories, and concepts of Medium/Heavy Duty Diesel Truck Technology, and include instruction of Diesel Engines, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Drivetrains, Preventive Maintenance, and Engine Performance Systems.

BEST PRACTICE COURSES

Complete (4) four credits from the following:

- 470450 Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section A
- 470451 Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section B
- 470452 Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section C
- 470453 Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section D

Diesel Medium/Heavy Truck Service Technology Technician (TST) CIP 47.0605.08

This program presents the theory, component identification, operation, diagnosis, and the service and repair of Medium/Heavy Duty Truck Diesel Engines, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Drivetrain Systems, Engine Performance Systems, and Preventive Maintenance. The instruction will also include identification and use of appropriate tools and testing/measurement equipment required to accomplish certain tasks. The student will also locate and use current reference and training materials from accepted industry publications and resources, and write industry standard work orders.

BEST PRACTICE COURSES

Complete (4) four credits from the Diesel Medium/Heavy Truck Inspection, Maintenance, and Minor Repair Technician Pathway.

Complete (4) courses from the following:

- 470460 Diesel Medium/Heavy Truck Service Technology (TST) Section A
- 470461 Diesel Medium/Heavy Truck Service Technology (TST) Section B
- 470462 Diesel Medium/Heavy Truck Service Technology (TST) Section C
- 470463 Diesel Medium/Heavy Truck Service Technology (TST) Section D

Master Medium/Heavy Diesel Truck Service Technology (MTST) CIP 47.0605.09

This is an advanced program that presents the theory, component identification, operation, diagnosis, and the service and repair of Medium/Heavy Duty Truck Diesel engines, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Drivetrain Systems, Engine Performance Systems, and Preventive Maintenance. In all areas, appropriate theory, safety, and support instruction will be taught and required for performing each task. The instruction will also include identification and use of appropriate tools and testing/measurement equipment required to accomplish certain tasks. The student will also locate and use current reference and training materials from accepted industry publications and resources, and write industry standard work orders.

BEST PRACTICE COURSES

Complete (4) four credits from the Diesel Medium/Heavy Truck Inspection, Maintenance, and Minor Repair Technician Pathway

Complete (4) four credits from the Diesel Medium/Heavy Truck Service Technology Technician Pathway.

Complete (2) two credits from the following:

- 470470 Master Medium/Heavy Diesel Truck Service Technology (MTST) Section A
- 470471 Master Medium/Heavy Diesel Truck Service Technology (MTST) Section B

DIESEL/MEDIUM-HEAVY TRUCK COURSES

Basic Automotive Electricity 470556

This course introduces the student to the principles, theories, and concepts of the automotive electrical system that include the unique diagramming, coding and locating of wiring, and component devices. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required for performing each task, including proper care and cleaning of customers' vehicles. 2. The instruction has included identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources; 4. In all areas, the student has demonstrated the ability to write work orders and warranty reports to include information regarding problem resolution and the results of the work performed for the customer and manufacturer. The writing process will incorporate the "Three C's" (concern, cause and correction) as a format to communicate this information.

Recommended Grade Level: 10 - 12

Recommended Credit: 1

Students will:

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
2. Identify and interpret electrical/electronic system concern; determine necessary action.
3. Research applicable vehicle and service information such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.
4. Locate and interpret vehicle and major component identification numbers.
5. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).
6. Use wiring diagrams during diagnosis of electrical circuit problems.
7. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems, including source voltage, voltage drop, current flow, and resistance.
8. Check electrical circuits with a test light; determine necessary action.
9. Check electrical circuits using fused jumper wires; determine necessary action.
10. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.
11. Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.
12. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
13. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action.
14. Remove and replace terminal end from connector; replace connectors and terminal ends.
15. Repair wiring harness (including CAN/BUS systems).
16. Perform solder repair of electrical wiring.

17. Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.

Brakes (Diesel) 470422

This course introduces the theory and operation of air and hydraulic braking systems. This will include components such as air and hydraulic actuators, air brake chambers, disc drums, lining, and brake adjustments. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Identify poor stopping, air leaks, premature wear, pulling, grabbing, dragging, or balance problems caused by supply and service system malfunctions; determine needed action.
2. Check air system build-up time; determine needed action.
3. Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.
4. Inspect compressor drive gear and coupling; replace as needed.
5. Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.
6. Inspect and test air system pressure controls; governor, unloader assembly valves, filters, lines, hoses, and fittings; adjust or replace as needed.
7. Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.
8. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, manual and automatic drain valves; replace as needed.
9. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.
10. Inspect and test brake application (foot) valve, fittings, and mounts; check pedal operation; replace as needed.
11. Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.
12. Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.
13. Inspect and test brake relay valves; replace as needed.
14. Inspect and test quick release valves; replace as needed.
15. Inspect and test tractor protection valve; replace as needed.
16. Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed.
17. Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.

18. Inspect and test air pressure gauges, lines, and fittings; replace as needed.
19. Identify poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed action.
20. Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.
21. Inspect and service slack adjusters; perform needed action.
22. Inspect camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed.
23. Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs.
24. Inspect and measure brake shoes or pads; perform needed action.
25. Inspect and measure brake drums or rotors; perform needed action.
26. Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.
27. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
28. Inspect and test parking (spring) brake application and release valve; replace as needed.
29. Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturer's recommendation.
30. Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system; determine needed action.
31. Check brake pedal pushrod length; adjust as needed.
32. Inspect and test master cylinder for internal/external leaks and damage; replace as needed.
33. Inspect hydraulic system brake lines, flexible hoses, and fittings for leaks and damage; replace as needed.
34. Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.
35. Inspect and test brake pressure differential valve and warning light circuit switch, bulbs, wiring, and connectors; repair or replace as needed.
36. Inspect disc brake caliper assemblies; replace as needed.
37. Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type.
38. Identify poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action.
39. Inspect and measure rotors; perform needed action.
40. Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
41. Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.
42. Identify stopping problems caused by the brake assist (booster) system; determine needed action.
43. Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type.
44. Check emergency (back-up, reserve) brake assist system.
45. Observe antilock brake system (ABS) warning light operation (includes dash mounted trailer ABS warning light); determine needed action.

46. Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.
47. Identify poor stopping and wheel lock-up problems caused by failure of the antilock brake system (ABS); determine needed action.
48. Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.
49. Test antilock brake system (ABS) wheel speed sensors and circuits; adjust or replace as needed.
50. Bleed the ABS hydraulic circuits following manufacturer's procedures.
51. Observe automatic traction control (ATC) warning light operation; determine needed action.
52. Diagnose automatic traction control (ATC) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.
53. Clean, inspect, lubricate and replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings.
54. Inspect or replace extended service wheel bearing assemblies.

Climate Control (Diesel) and Lab 470438

This course introduces the theory and operation of heating and air conditioning systems. Air conditioning terminology and how to service and troubleshoot mechanical and electrical circuits of heating and air conditioning systems are emphasized. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task. 2. This instruction includes identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks. 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.
2. Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.
3. Identify system type and components (cycling clutch orifice tube—CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.
4. Retrieve diagnostic codes; determine needed action.
5. Identify causes of temperature control problems in the A/C system; determine needed action.
6. Identify refrigerant and lubricant types; check for contamination; determine needed action.
7. Identify A/C system problems indicated by pressure gauge and temperature readings; determine needed action.
8. Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.
9. Perform A/C system leak test; determine needed action.
10. Recover, evacuate, and recharge A/C system using appropriate equipment.
11. Identify contaminated A/C system components and hoses; determine needed action.
12. Identify A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.
13. Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.
14. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.
15. Inspect, test, service, or replace A/C compressor clutch components or assembly.
16. Inspect and correct A/C compressor lubricant level (if applicable).
17. Inspect, test, or replace A/C compressor.
18. Inspect, repair, or replace A/C compressor mountings and hardware.

19. Correct system lubricant level when replacing the evaporator, condenser, receiver-drier or accumulator/drier, and hoses.
20. Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.
21. Inspect A/C condenser for proper air flow.
22. Inspect and test A/C system condenser and mountings; determine needed action.
23. Inspect and replace receiver/drier or accumulator/drier.
24. Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.
25. Remove and replace orifice tube.
26. Inspect and test secondary unit evaporator core; determine needed action.
27. Inspect, clean, or repair evaporator housing and water drain; inspect and service/replace evaporator air filter.
28. Identify and inspect A/C system service ports (gauge connections); determine needed action.
29. Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.
30. Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.
31. Identify window fogging problems; determine needed action.
32. Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.
33. Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.
34. Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.
35. Inspect water pump for leaks and bearing play; determine needed action.
36. Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.
37. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
38. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
39. Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.
40. Inspect and flush heater core; determine needed action.
41. Identify causes of HVAC electrical control system problems; determine needed action.
42. Inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.
43. Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.
44. Inspect and test A/C related electronic engine control systems; determine needed action.
45. Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.
46. Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.
47. Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.

48. Identify causes of HVAC air and mechanical control problems; determine needed action.
49. Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.
50. Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.
51. Inspect and test HVAC system actuators and hoses; determine needed action.
52. Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.
53. Maintain and verify correct operation of certified equipment.
54. Identify and recover A/C system refrigerant.
55. Recycle or properly dispose of refrigerant.
56. Handle, label, and store refrigerant.
57. Test recycled refrigerant for non-condensable gases.

Cooperative Education I 470442

Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Diesel Engine Repair 470423

Students learn to take a disassembled engine and evaluate the condition of each component. They identify the use or function of each component of the engine. Topics include cylinder block and components, cylinder heads and valve train components, and engine lubrication systems. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and test and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Perform air intake system restriction and leakage tests; determine needed action.
2. Perform intake manifold pressure (boost) test; determine needed action.
3. Perform exhaust back pressure test; determine needed action.
4. Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
5. Inspect and test turbocharger(s), (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.
6. Check air induction system; piping, hoses, clamps, and mounting; service or replace air filter as needed.
7. Remove and reinstall turbocharger/wastegate assembly.
8. Inspect intake manifold, gaskets, and connections; replace as needed.
9. Inspect, clean, and test charge air cooler assemblies; inspect aftercooler assemblies; replace as needed.
10. Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
11. Inspect exhaust after treatment devices; determine necessary action.
12. Inspect and test preheater-inlet air heater, or glow plug system and controls; perform needed action.
13. Inspect and test exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.
14. Check fuel level and condition; determine needed action.
15. Perform fuel supply and return system tests; determine needed action.
16. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.
17. Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.

18. Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.
19. Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.
20. Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time a distributor (rotary) type injection pump; determine needed action.
21. Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time an in-line type injection pump; determine needed action.
22. Inspect and adjust throttle control linkage; determine needed action.
23. Inspect air/fuel ratio control systems; determine needed action.
24. Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action.
25. Inspect high pressure injection lines, hold downs, fittings and seals; replace as needed.
26. Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM); determine needed action.
27. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software and/or data scan tools); determine further diagnosis.
28. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
29. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
30. Inspect and replace electrical connector terminals, seals, and locks.
31. Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
32. Using recommended electronic diagnostic tools (to include PC based software and/or data scan tools), access and interpret customer programmable parameters.
33. Inspect, test, and adjust electronic unit injectors (EUI); determine needed action.
34. Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
35. Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
36. Perform on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls; determine needed action.
37. Perform on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems; determine needed action.
38. Perform on-engine inspections and tests on common rail type injection systems; determine needed action.
39. Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action.
40. Inspect and adjust engine compression/exhaust brakes; determine needed action.
41. Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; repair or replace as needed.
42. Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings; repair or replace as needed.

Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section A 470450

These courses introduce the student to the tasks/standards included in the Inspection, Maintenance, and Minor Repair. The tasks included in the Inspection, Maintenance and Minor Repair option are entry-level technician inspection tasks designed to introduce the student to correct procedures and practices of vehicle inspection in a teaching/learning environment. These courses will instruct the student in the principles, theories, and concepts of Medium/Heavy Duty Diesel Truck Technology, and include instruction on Diesel Engines, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Drivetrains, Preventive Maintenance and Engine Performance Systems. In all areas, appropriate theory, safety, and support instruction will be taught and required for performing each task. The instruction will also include identification and use of appropriate tools and testing/measurement equipment required to accomplish certain tasks. The student will also receive the necessary training to locate and use current reference and training materials from accepted industry publications and resources, and demonstrate the ability to write work orders.

These courses are not intended to satisfy the Annual Federal Vehicle Inspection requirement as prescribed in the Federal Motor Carrier Safety Regulations, Part 396, Appendix G to Subchapter B, Minimum Periodic Inspection Standards. Courses A, B, C and D can be completed in any sequence.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. **DIESEL ENGINES GENERAL:**
    a. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
    b. Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant.
    c. Inspect engine assembly for fuel, oil, coolant, air, and other leaks.
    d. Check engine operation (starting and running) including: noise, vibration, and smoke.
    e. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.
    f. Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking.
2. **CYLINDER HEAD AND VALVE TRAIN:**
    a. Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness.
3. **ENGINE BLOCK:**
    a. Inspect crankshaft vibration damper; inspect engine mounts.
4. **LUBRICATION SYSTEMS:**

a. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor.
b. Check engine oil level, condition, and consumption; take engine oil sample.
c. Determine proper lubricant; perform oil and filter service.

5. **COOLING SYSTEM:**
   a. Check engine coolant type, level, condition, and test coolant for freeze protection and additive package concentration.
   b. Verify coolant temperature; check operation of temperature and level sensors, gauge, and/or sending unit.
   c. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
   d. Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.
   e. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
   f. Inspect water pump, hoses, and clamps.
   g. Inspect, and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings.
   h. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud.
   i. Identify engine block heater(s).
6. **AIR INDUCTION AND EXHAUST SYSTEMS:**
   a. Inspect turbocharger(s), wastegate(s), and piping systems.
   b. Check air induction system including: cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable).
   c. Inspect intake manifold, gaskets, and connections.
   d. Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust after treatment system for leaks, mounting, proper routing, and damaged or missing components.
   e. Inspect crankcase ventilation system; service as needed.
7. **FUEL SYSTEM:**
   a. Check fuel level and condition.
   b. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings.
   c. Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware).
   d. Replace fuel filter; prime and bleed fuel system.
   e. Inspect high pressure fuel system components (fuel pump, pump drives, hoses, injection lines, filters, hold-downs, fittings, seals, and mounting hardware).
8. **ENGINE BRAKES:**
   a. Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings.
9. **HYDRAULICS GENERAL:**

a. Research vehicle service information, including vehicle service history, service precautions, fluid type, and technical service bulletins.
b. Verify placement of equipment/component safety labels and placards; determine needed action.
c. Identify hydraulic system components; locate filtration system components; service filters and breathers.
d. Check fluid level and condition; take a hydraulic fluid sample for analysis.
e. Inspect hoses and connections for leaks, proper routing, and proper protection; determine needed action.

10. **BRAKES GENERAL:**
    a. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
    b. Identify brake system components and configurations (including air and hydraulic systems, parking brake, power assist, and vehicle dynamic brake systems).
    c. Identify brake performance problems caused by the mechanical/foundation brake system (air and hydraulic).
11. **AIR BRAKES: AIR SUPPLY AND SERVICE SYSTEMS:**
    a. Inspect air supply system components such as compressor, governor, air drier, tanks, and lines; inspect service system components such as lines, fittings, mountings, and valves (hand brake/trailer control, brake relay, quick release, tractor protection, emergency/spring brake control/modulator, pressure relief/safety).
    b. Verify proper gauge operation and readings; verify low pressure warning alarm operation; perform air supply system tests such as pressure build-up, governor settings, and leakage; drain air tanks and check for contamination.
12. **MECHANCAL/FOUNDATION BRAKE SYSTEM:**
    a. Inspect service brake chambers, diaphragms, clamps, springs, pushrods, clevises, and mounting brackets; determine needed action.
    b. Identify slack adjuster type; inspect slack adjusters; determine needed action.
    c. Check camshafts (S-cams), tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; determine needed action.
    d. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.
    e. Inspect, clean, and adjust air disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
    f. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; determine needed action.
13. **PARKING BRAKE SYSTEM:**
    a. Inspect and check parking (spring) brake chamber for leaks; determine needed action.
    b. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; determine needed action.
    c. Inspect and test parking (spring) brake application and release valve; determine needed action.
    d. Manually release (cage) and reset (uncage) parking (spring) brakes.

e. Hydraulic Brakes: Hydraulic System
f. Check master cylinder fluid level and condition; determine proper fluid type for application.
g. Inspect hydraulic brake system components for leaks and damage.
h. Check hydraulic brake system operation including pedal travel, pedal effort, and pedal feel.

14. **HYDRALIC BRAKES: MECHANICAL/FOUNDATION BRAKE SYSTEM:**
    a. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.
    b. Inspect and clean disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; determine needed action.
    c. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; inspect wheel cylinders; determine needed action.
15. **HYDRAULIC BRAKES: PARKING BRAKE SYSTEM:**
    a. Check parking brake operation; inspect parking brake application and holding devices.
    b. Power Assist Systems
    c. Check brake assist/booster system (vacuum or hydraulic) hoses and control valves; check fluid level and condition (if applicable).
    d. Check operation of emergency (back-up/reserve) brake assist system.
    e. Observe antilock brake system (ABS) warning light operation including trailer and dash mounted trailer ABS warning light.
    f. Observe automatic traction control (ATC) and electronic stability control (ESC) warning light operation
16. **WHEEL BEARINGS:**
    a. Clean, inspect, lubricate, and/or replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings; check hub assembly fluid level and condition; verify end play with dial indicator method.
    b. Identify, inspect, and/or replace unitized/preset hub bearing assemblies.
17. **CAB GENERAL:**
    a. Research vehicle service information including, vehicle service history, service precautions, and technical service bulletins.
    b. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.
18. **INSTRUMENTS AND CONTROLS:**
    a. Inspect mechanical key condition; check operation of ignition switch; check operation of indicator lights, warning lights and/or alarms; check instruments; record oil pressure and system voltage; check operation of electronic power take-off (PTO) and engine idle speed controls (if applicable).
    b. Check operation of all accessories.
    c. Understand operation of auxiliary power unit (APU)/electric power unit (EPU).
19. **SAFETY EQUIPMENT:**

a. Check operation of horns (electric and air); check warning device operation (reverse, air pressure); check condition of spare fuses, safety triangles, fire extinguisher, and all required decals; inspect seat belts and sleeper restraints; inspect condition of wiper blades and arms.

20. **HARDWARE:**
    a. Check operation of wipers and washer; inspect windshield glass for cracks or discoloration; check sun visor; check seat condition, operation, and mounting; check door glass and window operation; verify operation of door and cab locks; inspect steps and grab handles; inspect mirrors, mountings, brackets, and glass.
    b. Record all physical damage.
    c. Lubricate all cab grease fittings; inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.
    d. Inspect cab mountings, hinges, latches, linkages, and ride height.
    e. Inspect quarter fender, mud flaps, and brackets.
21. **ELECTRICAL/ELECTRONIC SYSTEMS GENERAL:**
    a. Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins.
    b. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
    c. Demonstrate proper use of test equipment when measuring source voltage, voltage drop (including grounds), current flow, continuity, and resistance.
    d. Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
    e. Use wiring diagrams to trace electrical/electronic circuits.
    f. Measure parasitic (key-off) battery drain.
    g. Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses.
    h. Inspect, repair (including solder repair), and/or replace connectors, seals, terminal ends, and wiring; verify proper routing and securement.
    i. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
    j. Check for malfunctions caused by faults in the data bus communications network.
    k. Identify electrical/electronic system components and configuration.
22. **BATTERY SYSTEM:**
    a. Identify battery type and system configuration.
    b. Confirm proper battery capacity for application; perform battery state-of-charge test; perform battery capacity test, determine needed action.
    c. Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs; determine needed action.
    d. Charge battery using appropriate method for battery type.
    e. Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply.
    f. Identify low voltage disconnect (LVD) systems.
23. **STARTING SYSTEM:**
    a. Demonstrate understanding of starter system operation.
    b. Perform starter circuit cranking voltage and voltage drop tests.

c. Inspect starter control circuit switches, relays, connectors, terminals, wires, and harnesses (including over-crank protection).

24. **CHARGING SYSTEM:**
    a. Identify and understand operation of the generator (alternator).
    b. Check instrument panel mounted voltmeters and/or indicator lamps.
    c. Inspect generator (alternator) drive belt condition; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment.
    d. Inspect cables, wires, and connectors in the charging circuit.
    e. Perform charging system voltage and amperage output tests; perform AC ripple test.
25. **LIGHTING SYSTEMS:**
    a. Inspect for brighter-than-normal, intermittent, dim, or no-light operation; determine needed action.
    b. Test, replace, and aim headlights.
    c. Inspect cables, wires, and connectors in the lighting systems.
    d. Inspect tractor-to-trailer multi-wire connectors, cables, and holders.
26. **INSTRUMENT CLUSTER AND DRIVER INFORMATION SYTEMS:**
    a. Check gauge and warning indicator operation.
    b. Identify the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information system, and warning systems.
27. **DRIVE TRAIN GENERAL:**
    a. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
    b. Identify drive train components, transmission type, and configuration.
28. **CLUTCH:**
    a. Inspect and adjust clutch, clutch brake, linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push-type and pull-type); check pedal height and travel; determine needed action.
    b. Inspect clutch master cylinder fluid level; check clutch master cylinder, slave cylinder, lines, and hoses for leaks and damage; determine needed action.
    c. **TRANSMISSION:** Inspect transmission shifter and linkage; inspect transmission mounts, insulators, and mounting bolts.
    d. Inspect transmission for leakage; determine needed action.
    e. Replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; determine needed action.
    f. Check transmission fluid level and condition; determine needed action.
    g. Inspect transmission breather; inspect transmission oil filters, coolers and related components; determine needed action.
    h. Inspect speedometer components.
    i. Inspect and test function of reverse light, neutral start, and warning device circuits.
29. **DRIVESHAFT AND UNIVERSAL JOINTS**:
    a. Inspect, service, and/or replace driveshafts, slip joints, yokes, drive flanges, support bearings, universal joints, boots, seals, and retaining/mounting hardware; check phasing of all shafts.

30. **DRIVE AXLES:**
    a. Check for fluid leaks; inspect drive axle housing assembly, cover plates, gaskets, seals, vent/breather, and magnetic plugs.
    b. Check drive axle fluid level and condition; check drive axle filter; determine needed action.
    c. Inspect air-operated power divider (inter-axle differential) assembly including: diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.
    d. Inspect drive axle shafts; determine needed action.
    e. Remove and replace wheel assembly; check rear wheel seal and axle flange for leaks; determine needed action.
31. **SUSPENSION AND STEERING SYSTEMS GENERAL:**
    a. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
    b. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.
    c. Identify suspension and steering system components and configurations.
32. **STEERING COLUMN:**
    a. Check steering wheel for free play, binding, and proper centering; inspect and service steering shaft U-joint(s), slip joint(s), bearings, bushings, and seals; phase steering shaft.
    b. Check operation of tilt and telescoping steering column.
    c. Check cab mounting.
33. **STEERING PUMP AND GEAR UNITS:**
    a. Check power steering pump and gear operation, mountings, lines, and hoses; check fluid level and condition; service filter; inspect system for leaks.
    b. Flush and refill power steering system; purge air from system.
34. **STEERING LINKAGE:**
    a. Inspect tie rod ends, ball joints, kingpins, pitman arms, idler arms, and other steering linkage components; lubricate as needed.
35. **SUSPENSION SYSTEMS:**
    a. Inspect shock absorbers, bushings, brackets, and mounts; determine needed action.
    b. Inspect leaf springs, center bolts, clips, pins, bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action.
    c. Inspect axle and axle aligning devices such as: radius rods, track bars, stabilizer bars, and torque arms; inspect related bushings, mounts, and shims.
    d. Inspect tandem suspension equalizer components.
    e. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; check and record ride height.
    f. Inspect air springs, mounting plates, springs, suspension arms, and bushings.
36. **WHEEL ALIGNMENT:**
    a. Demonstrate understanding of alignment angles.
37. **WHEELS AND TIRES:**
    a. Inspect tire condition; identify tire wear patterns; measure tread depth; verify tire matching (diameter and tread); inspect valve stem and cap; set tire pressure.
    b. Identify wheel/tire vibration, shimmy, pounding, and hop (tramp) problems.

c. Check wheel mounting hardware; check wheel condition; remove and install wheel/tire assemblies (steering and drive axle); torque fasteners to manufacturer's specification using torque wrench.

38. **FRAME AND COUPLING DEVICES:**
    a. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, mounting hardware, air lines, and fittings.
    b. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage.
    c. Inspect frame hangers, brackets, and cross members.
    d. Check pintle hook and mounting (if applicable).
39. **HEATING, VENTILATION AND AIR CONDITIONING (HVAC) GENERAL:**
    a. Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.
    b. Identify heating, ventilation, and air conditioning (HVAC) components and configuration.
    c. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
40. **REFRIGERATION SYSTEM COMPONENTS:**
    a. Inspect A/C compressor drive belts, pulleys, and tensioners; verify proper belt alignment.
    b. Check A/C system operation including system pressures; visually inspect A/C components for signs of leaks; check A/C monitoring system (if applicable).
    c. Inspect A/C condenser for airflow restrictions; determine needed action.
41. **HEATING, VENTILATION AND ENGINE COOLING SYSTEMS:**
    a. Inspect engine cooling system and heater system hoses and pipes; determine needed action.
    b. Inspect HVAC system-heater ducts, doors, hoses, cabin filters, and outlets; determine needed action.
    c. Identify the source of A/C system odors.
42. **OPERATING SYSTEMS AND RELATED CONTROLS:**
    a. Verify blower motor operation; confirm proper air distribution; confirm proper temperature control; determine needed action.

Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section B 470451

The entire description and all Tasks/Standards for the Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Sections A, B, C, and D are listed in the Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section C 470452

The entire description and all Tasks/Standards for the Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Sections A, B, C, and D are listed in the Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section D 470453

The entire description and all Tasks/Standards for the Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Sections A, B, C, and D are listed in the Diesel Medium/Heavy Duty Truck Inspection, Maintenance, and Minor Repair (IMMR) Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Diesel Medium/Heavy Truck Service Technology (TST) Section A 470460

These courses present the theory, component identification, operation, diagnosis, and the service and repair of Medium/Heavy Duty Truck Diesel Engines, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Drivetrain Systems, Engine Performance Systems, and Preventive Maintenance. In all areas, appropriate theory, safety, and support instruction will be taught and required for performing each task. The instruction will also include identification and use of appropriate tools and testing/measurement equipment required to accomplish certain tasks. The student will also locate and use current reference and training materials from accepted industry publications and resources, and write industry standard work orders. Courses A, B, C and D can be completed in any sequence.

Prerequisite: Completion of all Diesel Medium/Heavy Duty Truck Inspection, Maintenance and Minor Repair (IMMR) courses, Sections A, B, C and D

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Students will:

1. **DIESEL ENGINES GENERAL:**
    a. Inspect engine assembly for fuel, oil, coolant, air, and other leaks; determine needed action.
    b. Check engine operation (starting and running) including: noise, vibration, and smoke; determine needed action.
    c. Check engine no-crank, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
    d. Check engine surging, rough operation, misfiring, and/or shut down problems; determine needed action.
2. **CYLINDER HEAD AND VALVE TRAIN:**
    a. Inspect electronic wiring harness and brackets for wear, bending, cracks, and proper securement; determine needed action.
    b. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.
    c. Inspect injector sleeves and seals; determine needed action.
    d. Inspect valve train components; determine needed action.
    e. Adjust valve bridges (crossheads); adjust valve clearances and injector settings.
3. **ENGINE BLOCK:**
    a. Inspect crankshaft vibration damper; inspect engine mounts; determine needed action.
    b. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
    c. Perform crankcase pressure test.

d. Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s); measure flywheel housing face and bore runout; determine needed action.
e. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.

4. **LUBRICATION SYSTEMS:**
   a. Test engine oil pressure; check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor; determine needed action.
   b. Check engine oil level, condition, and consumption; take engine oil sample; determine needed action.
   c. Inspect, clean, and test oil cooler and components.
   d. Inspect turbocharger lubrication systems.
5. **COOLING SYSTEM:**
   a. Test coolant temperature; test operation of temperature and level sensors, gauge, and/or sending unit; determine needed action.
   b. Inspect water pump, hoses, and clamps; determine needed action.
   c. Inspect and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings; determine needed action.
   d. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; determine needed action.
   e. Diagnose engine coolant consumption; determine needed action.
   f. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
   g. Inspect turbocharger cooling systems.
6. **AIR INDUCTION AND EXHAUST SYSTEMS:**
   a. Inspect turbocharger(s), wastegate(s), and piping systems; determine needed action.
   b. Inspect intake manifold, gaskets, and connections; determine needed action.
   c. Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust after treatment system for leaks, mounting, proper routing, and damaged or missing components; determine needed action.
   d. Demonstrate knowledge of exhaust gas recirculation (EGR) system including: EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.
   e. Perform air intake system restriction and leakage tests; determine needed action.
   f. Perform intake manifold pressure (boost) test; determine needed action.
   g. Check exhaust back pressure.
   h. Inspect variable ratio geometry turbocharger (VGT), controls, and actuators (pneumatic, hydraulic, and electronic).
   i. Demonstrate knowledge of charge air cooler operation and testing.
   j. Demonstrate knowledge of exhaust after treatment systems, operation, and components.
   k. Inspect and/or replace preheater/inlet air heater or glow plug system and control**s.**
7. **FUEL SYSTEMS:**
   a. Check fuel level and condition; determine needed action.

b. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings; determine needed action.
c. Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware); determine needed action.
d. Demonstrate knowledge and understanding of the different types of fuel systems.
e. Perform fuel supply and return system tests; determine needed action.
f. Perform cylinder contribution test using electronic service tool(s).

8. **ENGINE BRAKES:**
    a. Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings; determine needed action.
    b. Inspect and adjust engine compression and/or exhaust brake systems; determine needed action.
    c. Inspect, test, and adjust engine compression and/or exhaust brake control circuits, switches, and solenoids; determine needed action.
9. **HYDRAULICS GENERAL:**
    a. Verify placement of equipment/component safety labels and placards; determine needed action.
    b. Check fluid level and condition; take a hydraulic fluid sample for analysis; determine needed action.
10. **BRAKES GENERAL:**
    a. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
11. **AIR BRAKES: AIR SUPPLY AND SERVICE SYSTEMS:**
    a. Inspect and test air supply system components such as compressor, governor, air drier, tanks, and lines; inspect service system components such as lines, fittings, mountings, and valves (hand brake/trailer control, brake relay, quick release, tractor protection, emergency/spring brake control/modulator, pressure relief/safety); determine needed action.
    b. Test gauge operation and readings; test low pressure warning alarm operation; perform air supply system tests such as pressure build-up, governor settings, and leakage; drain air tanks and check for contamination; determine needed action.
    c. Demonstrate knowledge and understanding of air supply and service system components and operations.
    d. Inspect air compressor drive gear components (gears, belts, tensioners, and/or couplings); determine needed action.
    e. Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.
    f. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, manual and automatic drain valves; determine needed action.
    g. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; determine needed action.

h. Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; determine needed action.

12. **AIR BRAKES: MECHANICAL/FOUNDATION BRAKE SYSTEM:**
    a. Inspect and test service brake chambers, diaphragms, clamps, springs, pushrods, clevises, and mounting brackets; determine needed action.
    b. Identify slack adjuster type; inspect slack adjusters; perform needed action.
    c. Check camshafts (S-cams), tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; perform needed action.
    d. Identify concerns related to the mechanical/foundation brake system including poor stopping, brake noise, premature wear, pulling, grabbing, or dragging; determine needed action.
13. **AIR BRAKES: PARKING BRAKE SYSTEM:**
    a. Inspect, test, and/or replace parking (spring) brake chamber.
    b. Inspect, test, and/or replace parking (spring) brake check valves, lines, hoses, and fittings.
    c. Inspect, test, and/or replace parking (spring) brake application and release valve.
    d. Identify and test anti-compounding brake function.
14. **HYDRAULIC BRAKES: HYDRAULIC SYSTEM:**
    a. Inspect hydraulic brake system for leaks and damage; test, repair, and/or replace hydraulic brake system components.
    b. Check hydraulic brake system operation including pedal travel, pedal effort, and pedal feel; determine needed action.
    c. Identify poor stopping, premature wear, pulling, dragging, imbalance, or poor pedal feel caused by problems in the hydraulic system; determine needed action.
    d. Test master cylinder for internal/external leaks and damage; replace as needed.
    e. Test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; determine needed action.
    f. Test brake pressure differential valve; test warning light circuit switch, bulbs/LEDs, wiring, and connectors; determine needed action.
    g. Bleed and/or flush hydraulic brake system.
15. **HYDRAULIC BRAKES: MECHANICAL/FOUNDATION BRAKE SYSTEM:**
    a. Inspect and clean disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware and slides; perform needed action.
16. **HYDRAULIC BRAKES: PARKING BRAKE SYSTEM:**
    a. Check parking brake operation; inspect parking brake application and holding devices; adjust, repair, and/or replace as needed.
17. **POWER ASSIST SYSTEMS:**
    a. Identify concerns related to the power assist system (vacuum or hydraulic), including stopping problems caused by the brake assist/booster system; determine needed action.
    b. Inspect, test, repair, and/or replace hydraulic brake assist/booster systems, hoses, and control valves.
18. **VEHICLE DYNAMIC BRAKE SYSTEMS (AIR AND HYDRAULIC): ANTILOCK BRAKE SYSTEM (ABS), AUTOMATIC TRACTION CONTROL (ATC) SYSTEM, AND ELECTRONIC STABILITY CONTROL (ESC) SYSTEM:**

a. Observe antilock brake system (ABS) warning light operation including trailer and dash mounted trailer ABS warning light; determine needed action.
b. Observe automatic traction control (ATC) and electronic stability control (ESC) warning light operation; determine needed action.
c. Identify stopping concerns related to the vehicle dynamic brake systems: ABS, ATC, and ESC; determine needed action.
d. Diagnose problems in the vehicle dynamic brake control systems; determine needed action.
e. Check and test operation of vehicle dynamic brake system (air and hydraulic) mechanical and electrical components; determine needed action.
f. Test vehicle/wheel speed sensors and circuits; adjust, repair, and/or replace as needed.
g. Bleed ABS hydraulic circuits.
h. Verify power line carrier (PLC) operation.

19. **CAB SAFETY EQUIPMENT:**
    a. Test operation of horns (electric and air); test warning device operation (reverse, air pressure); check condition of spare fuses, safety triangles, fire extinguisher, and all required decals; inspect seat belts and sleeper restraints; inspect condition of wiper blades, arms, and linkage; determine needed action.
20. **CAB HARDWARE:**
    a. Test operation of wipers and washer; inspect windshield glass for cracks or discoloration; check sun visor; check seat condition, operation, and mounting; check door glass and window operation; verify operation of door and cab locks; inspect steps and grab handles; inspect mirrors, mountings, brackets, and glass; determine needed action.
    b. Inspect cab mountings, hinges, latches, linkages, and ride height; determine needed action.
    c. Inspect quarter fender, mud flaps, and brackets; determine needed action.
21. **ELECTRICAL/ELECTRONIC SYSTEMS GENERAL:**
    a. Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits; identify and locate faults in electrical/electronic circuits.
    b. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.
    c. Measure parasitic (key-off) battery drain; determine needed action.
    d. Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses; perform inspection and testing; determine needed action.
    e. Inspect, test, repair (including solder repair), and/or replace components, connectors, seals, terminal ends, harnesses, and wiring; verify proper routing and securement; determine needed action.
    f. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
    g. Check frequency, pulse width, and waveforms of electrical/electronic signals using appropriate test equipment; interpret readings; determine needed repairs.

22. **BATTERY SYSTEMS:**
    a. Check low voltage disconnect (LVD) systems; determine needed action.
    b. Inspect, clean, and service battery; replace as needed.
    c. Inspect and clean battery boxes, mounts, and hold-downs; repair or replace as needed.
    d. Test and clean battery cables and connectors; repair or replace as needed.
    e. Identify electrical/electronic modules, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
23. **STARTING SYSTEM:**
    a. Perform starter circuit cranking voltage and voltage drop tests; determine needed action.
    b. Inspect and test starter control circuit switches (key switch, push button, and/or magnetic switch), relays, connectors, terminals, wires, and harnesses (including over-crank protection); determine needed action.
    c. Identify causes of no-crank or slow crank condition; differentiate between electrical and engine mechanical problems; determine needed action.
    d. Perform starter current draw tests; determine needed action.
    e. Remove and replace starter; inspect flywheel ring gear or flex plate.
24. **CHARGING SYSTEM:**
    a. Test instrument panel mounted voltmeters and/or indicator lamps; determine needed action.
    b. Inspect, adjust, and/or replace generator (alternator) drive belt; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment; determine needed action.
    c. Inspect cables, wires, and connectors in the charging circuit; determine needed action.
    d. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.
    e. Perform charging circuit voltage drop tests; determine needed action.
    f. Remove, inspect, and/or replace generator (alternator).
25. **LIGHTING SYSTEMS:**
    a. Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of exterior lighting systems; determine needed action.
    b. Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of interior lighting systems; determine needed action.
    c. Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of auxiliary lighting circuits; determine needed action
26. **INSTRUMENT CLUSTER AND DRIVER INFORMATION:**
    a. Identify faults in the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information systems, and warning systems; determine needed action.
    b. Inspect electronic speedometer, odometer, and tachometer systems.

27. **DRIVE TRAIN CLUTCH:**

a. Inspect, adjust, repair, and/or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.
b. Inspect, adjust, lubricate, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.
c. Inspect, adjust, and/or replace single-disc clutch pressure plate and clutch disc.
d. Inspect, adjust, and/or replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.
e. Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; determine needed action.
f. Inspect, adjust, and/or replace self-adjusting/continuous-adjusting clutch mechanisms.
g. Inspect and/or replace pilot bearing.

28. **TRANSMISSION:**

a. Inspect speedometer components; determine needed action.
b. Inspect and test function of REVERSE light, NEUTRAL start, and warning device circuits; determine needed action.
c. Inspect, adjust, and replace transmission covers, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.
d. Identify causes of transmission noise, shifting concerns, lockup, jumping out-of-gear, overheating, and vibration problems.
e. Inspect, test, repair, and/or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.
f. Remove and reinstall transmission.
g. Inspect input shaft, gear, spacers, bearings, retainers, and slingers.
h. Inspect and adjust power take-off (PTO) assemblies, controls, and shafts.
i. Inspect and test transmission temperature gauge, wiring harnesses, and sensor/sending unit.
j. Inspect operation of automatic transmission, components, and controls; diagnose automatic transmission system problems; determine needed action.
k. Inspect operation of automated mechanical transmission, components, and controls; diagnose automated mechanical transmission system problems; determine needed action.

43. **DRIVESHAFT AND UNIVERSAL JOINTS:**

a. Identify causes of driveshaft and universal joint noise and vibration problems.
b. Inspect driveshaft center support bearings and mounts; determine needed action.
c. Measure driveline angles; determine needed action.

44. **DRIVE AXLES**:

a. Check drive axle fluid level and condition; check drive axle filter; determine needed action.
b. Inspect and/or adjust air-operated power divider (inter-axle differential) assembly including: diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.
c. Inspect, repair, or replace drive axle lubrication system pump, troughs, collectors, slingers, tubes, and filters.
d. Identify causes of drive axle(s) drive unit noise and overheating problems.

e. Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action.
f. Remove and replace differential carrier assembly.
g. Identify causes of drive axle wheel bearing noise and check for damage; perform needed action.

Diesel Medium/Heavy Truck Service Technology (TST) Section B 470461

The entire description and all Tasks/Standards for the Diesel Medium/Heavy Truck Service Technology (TST) Sections A, B, C, and D are listed in the Diesel Medium/Heavy Truck Service Technology (TST) Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Diesel Medium/Heavy Truck Service Technology (TST) Section C 470462

The entire description and all Tasks/Standards for the Diesel Medium/Heavy Truck Service Technology (TST) Sections A, B, C, and D are listed in the Diesel Medium/Heavy Truck Service Technology (TST) Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Diesel Medium/Heavy Truck Service Technology (TST) Section D 470463

The entire description and all Tasks/Standards for the Diesel Medium/Heavy Truck Service Technology (TST) Sections A, B, C, and D are listed in the Diesel Medium/Heavy Truck Service Technology (TST) Section A. **Courses and Standards/Tasks in A, B, C and D can be completed in any sequence.**

Electrical Systems for Diesel Equipment 470425

This course introduces the theory and operation of wiring circuits and battery service. This includes electrical safety, testing equipment, wiring, relays, switches, accessories, batteries, and lighting. Students learn the theory and operation of starting systems, charging systems, and motorized circuits. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Read and interpret electrical/electronic circuits using wiring diagrams.
2. Check continuity in electrical/electronic circuits using appropriate test equipment.
3. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.
4. Check current flow in electrical/electronic circuits and components using appropriate test equipment.
5. Check resistance in electrical/electronic circuits and components using appropriate test equipment.
6. Locate shorts, grounds, and opens in electrical/electronic circuits.
7. Identify parasitic (key-off) battery drain problems; perform tests; determine needed action.
8. Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.
9. Inspect and test spike suppression devices; replace as needed.
10. Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.
11. Perform battery load test; determine needed action.
12. Determine batter state of charge using an open circuit voltage test.
13. Inspect, clean, and service battery; replace as needed.
14. Inspect and clean battery boxes, mounts, and hold-downs; repair or replace as needed.
15. Charge battery using slow or fast charge method as appropriate.
16. Inspect, test, and clean battery cables and connectors; repair or replace as needed.
17. Pump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures.
18. Perform battery capacitance test; determine needed action.
19. Perform starter circuit cranking voltage and voltage drop tests; determine needed action.

20. Inspect, test, and replace components and wires in the starter control circuit (key switch, push button and/or magnetic switch).
21. Inspect, test, and replace starter relays and solenoids/switches.
22. Remove and replace starter; inspect flywheel ring gear or flex plate.
23. Test instrument panel mounted volt meters and/or indicator lamps; determine needed action.
24. Identify causes of a no charge, low charge, or overcharge problems; determine needed action.
25. Inspect, adjust, and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets.
26. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.
27. Perform charging circuit voltage drop tests; determine needed action.
28. Remove and replace alternator
29. Inspect, repair, or replace cables, wires, and connectors in the charging circuit.
30. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action.
31. Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.
32. Test, aim, and replace headlights.
33. Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.
34. Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, wires, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed.
35. Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.
36. Inspect and test interior cab light circuit switches, bulbs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed.
37. Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.
38. Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
39. Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
40. Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed.
41. Identify causes of intermittent, high, low, or no gauge readings; determine needed action.
42. Identify causes of data bus-driven gauge malfunctions; determine needed action.
43. Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.

44. Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed.
45. Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.
46. Identify causes of constant, intermittent, or no horn operation; determine needed action.
47. Inspect and test horn circuit relays, horns, switches, connectors, wires, and control components/modules; repair or replace as needed.
48. Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.
49. Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires and control components/modules; repair or replace as needed.
50. Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.
51. Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
52. Inspect and test sideview mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires and control components/modules; repair or replace as needed.
53. Inspect and test heater and A/C electrical components including A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
54. Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.
55. Identify causes of slow, intermittent, or no power side window operation; determine needed action.
56. Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power side window circuits; repair or replace as needed.
57. Inspect and test block heaters; determine needed repairs.
58. Inspect and test cruise control electrical components; repair or replace as needed.
59. Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits.
60. Check operation of keyless and remote lock/unlock devices; determine needed action.
61. Inspect and test engine cooling fan electrical control components/modules; repair or replace as needed.
62. Identify causes of data bus communication problems; determine needed action.
63. Measure ohms with an ohmmeter, measure voltage with a voltmeter, and measure amps with an ammeter.
64. Draw and interpret electrical symbols, construct series circuits, construct parallel circuits, and construct series-parallel circuits.
65. Diagnose AC voltage leakage (failed rectifier) at alternator output; determine needed action.

Hydraulics and Lab 470426

This course introduces the theory and operation of a complete hydraulic system including all components. Components include fluids, piping, reservoirs, actuators, directional valves, servo valves, pressure control valves, pumps, complete hydraulic circuits and accessories. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and test and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Identify system type (closed and open) and verify proper operation.
2. Read and interpret system diagrams and schematics.
3. Perform system temperature, pressure, flow, and cycle time tests; determine needed action.
4. Verify placement of equipment/component safety labels and placards; determine needed action.
5. Identify system fluid type.
6. Identify causes of pump failure, unusual pump noises, temperature, flow, and leakage problems; determine needed action.
7. Determine pump type, rotation, and drive system.
8. Remove and install pump; prime and/or bleed system.
9. Inspect pump inlet for restrictions and leaks; determine needed action.
10. Inspect pump outlet for restrictions and leaks; determine needed action.
11. Identify type of filtration system; verify filter application and flow direction.
12. Service filters and breathers.
13. Identify causes of system contamination; determine needed action.
14. Take a hydraulic oil sample.
15. Check reservoir fluid level and condition; determine needed action.
16. Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.
17. Diagnose causes of component leakage, damage, and restriction; determine needed action.
18. Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed.
19. Assemble hoses, tubes, connectors, and fittings in accordance with manufacturer's specifications; use proper procedures to avoid contamination.
20. Inspect and replace fitting seals and sealants.

21. Pressure test system safety relief valve; determine needed action.
22. Perform control valve operating pressure and flow tests; determine needed action.
23. Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).
24. Identify causes of control valve leakage problems (internal/external); determine needed action.
25. Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.
26. Identify actuator type (single/double acting, multi-stage/telescopic, and motors).
27. Identify the cause of seal failure; determine needed repairs.
28. Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs.
29. Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.
30. Remove, repair, and/or replace actuators in accordance with manufacturer's recommended procedures.
31. Inspect actuators for dents, cracks, damage, and leakage; determine needed action.
32. Purge and/or bleed system in accordance with manufacturer's recommended procedures.

Internship I (Diesel) 470445

Internship for CTE courses provide supervised worksite experience for high school students who are enrolled in a capstone course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester or longer and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less).

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Gain career awareness and the opportunity to test career choices.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Introduction to Diesel Engines 470421

This course introduces the fundamental concepts of the operation of two- and four-stroke diesel and gasoline engines. Topics included are basic engine components and their functions, engine performance terminology, two- and four-stroke operation, combustion principles, and engine disassembly with basic hand tools. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and test and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Inspect fuel, oil, and coolant levels and condition; determine needed action.
2. Identify causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.
3. Listen for engine noises; determine needed action.
4. Observe engine exhaust smoke color and quantity; determine needed action.
5. Identify causes of no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
6. Identify causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.
7. Identify engine vibration problem; determine needed action.
8. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; verify customer programmable parameters; clear codes; determine further diagnosis.
9. Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.
10. Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.
11. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.
12. Disassemble head and inspect valves, guides, seats, springs, retainer, rotators, locks, and seals; determine needed action.
13. Measure valve head height relative to deck and valve face-to-seat contact; determine needed action.
14. Inspect injector sleeves and seals; replace; measure injector tip or nozzle protrusion; determine needed action.
15. Inspect valve train components; determine needed action.
16. Reassemble cylinder head.

17. Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.
18. Inspect cam followers; determine needed action.
19. Adjust valve bridges (crossheads); adjust valve clearances and injector settings.
20. Perform crankcase pressure test; determine needed action.
21. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
22. Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pings, and bolts for serviceability; determine needed action.
23. Inspect cylinder sleeve counterbore and lower bore; check bore distortion; determine needed action.
24. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.
25. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
26. Inspect in-block camshaft bearings for wear and damage; determine needed action.
27. Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.
28. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passage(s); check passage plugs; measure journal diameter; determine needed action.
29. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.
30. Inspect, install, and time gear train; measure gear backlash; determine needed action.
31. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.
32. Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.
33. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
34. Inspect and measure crankshaft vibration damper; determine needed action.
35. Inspect, install, and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.
36. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.
37. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor; determine needed action.
38. Check engine oil level, condition, and consumption; determine needed action.
39. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.
40. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
41. Inspect, clean, and test oil cooler and components; determine needed action.
42. Inspect turbocharger lubrication and cooling systems; determine needed action.
43. Determine proper lubricant and perform oil and filter change.

44. Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action.
45. Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action.
46. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
47. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
48. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
49. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
50. Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed action.
51. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.

Master Medium/Heavy Diesel Truck Service Technology (MTST) Section A 470470

These advanced courses present the theory, component identification, operation, diagnosis, and the service and repair of Medium/Heavy Duty Truck Diesel Engines, Brake Systems, Electrical/Electronic Systems, Suspension and Steering Systems, Drivetrain Systems, Engine Performance Systems, and Preventive Maintenance. In all areas, appropriate theory, safety, and support instruction will be taught and required for performing each task. The instruction will also include identification and use of appropriate tools and testing/measurement equipment required to accomplish certain tasks. The student will also locate and use current reference and training materials from accepted industry publications and resources, and write industry standard work orders. Courses A and B can be completed in any sequence.

Prerequisite: Completion of all Diesel Medium Heavy Duty Truck Inspection, Maintenance and Minor Repair (IMMR) courses, Sections A, B, C and D, and Diesel Medium Heavy Truck Service Technology (TST) courses Sections A, B, C and D

Recommended Grade Level: 11 – 12

Recommended Credit: 1

Student will:

1. **DIESEL ENGINES GENERAL:**
    a. Diagnose engine operation (starting and running)
    b. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.
    c. Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking.
    d. Diagnose engine no-crank, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
    e. Diagnose engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and/or shut down problems; determine needed action.
2. **CYLINDER HEAD AND VALVE TRAIN:**
    a. Inspect, measure, and replace/reinstall camshaft; measure/adjust end play and backlash.
    b. Disassemble cylinder head; inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.
    c. Measure valve head height relative to deck; measure valve face-to-seat contact; determine needed action.
    d. Reassemble cylinder head.
    e. Inspect, measure, and replace/reinstall camshaft; measure end play and backlash; determine needed action.

3. **ENGINE BLOCK:**
    a. Perform crankcase pressure test; determine needed action.
    b. Disassemble and clean engine block; inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion plugs, and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.
    c. Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action.
    d. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.
    e. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
    f. Inspect camshaft bearings for wear and damage; determine needed action.
    g. Inspect, measure, and replace/reinstall camshaft; measure end play and backlash; determine needed action.
    h. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.
    i. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.
    j. Inspect, install, and time gear train; measure gear backlash; determine needed action.
    k. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; determine needed action.
    l. Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.
    m. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
    n. Check condition of piston cooling jets (nozzles); determine needed action.
4. **LUBRICATION SYSTEMS:**
    a. Inspect turbocharger lubrication systems; determine needed action.
    b. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.
    c. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
5. **COOLING SYSTEMS:**
    a. Inspect, test, and repair thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; determine needed action.
    b. Test engine block heater(s); determine needed action.
    c. Inspect turbocharger cooling systems; determine needed action.
6. **AIR INDUCTION AND EXHAUST SYSTEMS:**
    a. Diagnose air induction system problems; inspect, clean, and/or replace cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable).

b. Diagnose problems/faults in the exhaust gas recirculation (EGR) system including: EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.
c. Check exhaust back pressure; determine needed action.
d. Inspect variable ratio geometry turbocharger (VGT), controls, and actuators (pneumatic, hydraulic, and electronic); determine needed action.
e. Demonstrate knowledge of charge air cooler operation and testing.
f. Diagnose exhaust after treatment system performance problems; determine needed action.
a. Diagnose preheater/inlet air heater or glow plug system and controls: determine needed action.

7. **FUEL SYSTEMS:**
    a. Demonstrate knowledge of how to set performance parameters using electronic service tools and service information system access.
8. **DRIVE TRAIN GENERAL:**
    a. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
9. **CLUTCH:**
    a. Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.
    b. Remove and install flywheel; inspect mounting area on crankshaft; inspect rear main oil seal; measure crankshaft end play; determine needed action.
    c. Inspect flywheel and starter ring gear; measure flywheel face; measure pilot bore runout; determine needed action.
    d. Inspect flywheel housing-to-transmission housing/engine mating surface(s); measure flywheel housing face and bore runout; determine needed action.
10. **TRANSMISSION:**
    e. Identify causes of transmission noise, shifting concerns, lockup, jumping out-of-gear, overheating, and vibration problems; determine needed repairs.
    f. Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action.
    g. Inspect and adjust power take-off (PTO) assemblies, controls, and shafts; determine needed action.
    h. Inspect and test transmission temperature gauge, wiring harnesses, and sensor/sending unit; determine needed action.
11. **DRIVESHAFT AND UNIVERSAL JOINTS:**
    a. Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action.
12. **DRIVE AXLES:**
    a. Check and repair fluid leaks; inspect drive axle housing assembly, cover plates, gaskets, seals, vent/breather, and magnetic plugs.
    b. Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action.
    c. Identify causes of drive axle wheel bearing noise and check for damage; determine needed action.

d. Inspect and/or replace components of differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.
e. Inspect and replace components of locking differential case assembly.
f. Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.
g. Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.
h. Measure ring gear runout; determine needed action.
i. Measure and adjust drive pinion bearing preload.
j. Measure and adjust drive pinion depth.
k. Measure and adjust side bearing preload and ring gear backlash.
l. Check and interpret ring gear and pinion tooth contact pattern; determine needed action.
m. Inspect, adjust, or replace ring gear thrust block/screw.

13. **BRAKES/AIR BRAKES MECHANICAL/FOUNDATION BRAKE SYSTEM:**
    a. Diagnose concerns related to the mechanical/foundation brake system including poor stopping, brake noise, premature wear, pulling, grabbing, or dragging; determine needed action.
14. **HYDRAULIC BRAKES:**
    a. Diagnose poor stopping, premature wear, pulling, dragging, imbalance, or poor pedal feel caused by problems in the hydraulic system; determine needed action.
15. **HYDRAULIC BRAKES: MECHANICAL/FOUNDATION BRAKE SYSTEM:**
    a. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine necessary action.
    b. Remove, clean and inspect brake drums; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; inspect wheel cylinders; determine serviceability.
    c. Check disc brake caliper assembly mountings and slides; replace as needed.
16. **SUSPENSION AND STEERING/STEERING COLUMN:**
    a. Diagnose causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems.
17. **SUSPENSION SYSTEMS:**
    a. Inspect, repair, and/or replace air springs, mounting plates, springs, suspension arms, and bushings.
    b. Diagnose rough ride problems; determine needed action.
18. **WHEEL ALIGNMENT AND DIAGNOSIS:**
    a. Check, record, and adjust camber.
    b. Check, record, and adjust caster.
19. **ELECTRICAL/ELECTRONIC SYSTEMS GENERAL:**
    a. Diagnose faults in the data bus communications network; determine needed action.
    b. Understand the process for software transfer, software updates, and/or reprogramming of electronic modules.
20. **LIGHTING SYSTEMS:**
    a. Diagnose causes of brighter-than-normal, intermittent, dim, or no-light operation; determine needed action.

b. Diagnose faults in tractor-to-trailer multi-wire connector(s), cables, and holders; determine needed action.
c. Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of exterior lighting systems; determine needed action.
d. Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of interior lighting systems; determine needed action.
e. Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of auxiliary lighting circuits; determine needed action.

21. **INSTRUMENT CLUSTER AND DRIVER INFORMATION SYSTEMS:**
    a. Diagnose faults in the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information systems, and warning systems; determine needed action.
    b. Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.
22. **CAB AND CHASSIS ELECTRICAL SYSTEMS:**
    a. Diagnose operation of horn(s), wiper/washer, and occupant restraint systems.
    b. Understand operation of safety systems and related circuits (such as: speed control, collision avoidance, lane departure, and camera systems).
    c. Understand operation of comfort and convenience systems and related circuits (such as: power windows, power seats, power locks, remote keyless entry, steering wheel controls, and cruise control).
    d. Understand operation of entertainment systems and related circuits (such as: radio, DVD, navigation, speakers, antennas, and voice-activated accessories).
    e. Understand the operation of power inverter, protection devices, connectors, terminals, wiring, and control components/modules of auxiliary power systems.
    f. Understand operation of telematics systems.
    g. Diagnose faults in engine block and engine oil heater(s); determine needed action.
23. **HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) GENERAL:**
    a. Diagnose heating and air conditioning problems; determine needed action.
24. **REFRIGERATION SYSTEM COMPONENTS:**
    a. Inspect, remove, and/or replace receiver/drier or accumulator/drier.
    b. Inspect, remove, and/or replace expansion valve or orifice (expansion) tube.
    c. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.
    d. Determine procedure to remove and reinstall evaporator.
    e. Determine procedure to inspect and/or replace condenser.
25. **HEATING, VENTILATION AND ENGINE COOLING SYSTEMS**:
    a. Diagnose temperature control problems in the HVAC system; determine needed action.
    b. Determine procedure to remove, inspect, reinstall, and/or replace engine coolant and heater system components.

26. **OPERATING SYSTEMS AND RELATED CONTROLS:**
    a. Verify HVAC system blower motor operation; confirm proper air distribution; confirm proper temperature control; determine needed action.
    b. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.
    c. Diagnose A/C compressor clutch control systems; determine needed action.
    d. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the HVAC system; determine needed action.
27. **CAB GENERAL:**
    a. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.
28. **HYDRAULICS GENERAL:**
    a. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
    b. Read and interpret system diagrams and schematics.
    c. Perform system temperature, pressure, flow, and cycle time tests; determine needed action.
    d. Perform system operational tests; determine needed action.
29. **PUMPS:**
    a. Identify causes of pump failure, unusual pump noises, temperature, flow and leakage problems; determine needed action.
    b. Determine pump type, rotation, and drive system.
    c. Remove and install pump; prime and/or bleed system.
    d. Inspect pump inlet and outlet for restrictions and leaks; determine needed action.
30. **FILTERATION/RESEVOIRS (TANKS):**
    a. Identify type of filtration system; verify filter application and flow direction.
    b. Service filters and breathers.
    c. Identify causes of system contamination; determine needed action.
    d. Inspect, repair, and/or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply, and return lines.
31. **HOSES, FITTINGS AND CONNECTIONS:**
    a. Diagnose causes of component leakage, damage, and restriction; determine needed action.
    b. Inspect hoses and connections for leaks, proper routing, and proper protection; determine needed action.
    c. Assemble hoses, tubes, connectors, and fittings.
32. **CONTROL VALVES:**
    a. Pressure test system safety relief valve; determine needed action.
    b. Perform control valve operation pressure and flow tests; determine needed action.
    c. Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).
    d. Identify causes of control valve leakage problems (internal and external); determine needed action.

e. Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.

33. **ACTUATORS:**

a. Identify actuator type (single-acting, double-acting, multi-stage, telescopic, and motor).
b. Identify the cause of seal failure; determine needed action.
c. Identify the cause of incorrect actuator movement and/or leakage (internal and external); determine needed action.
d. Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.
e. Remove, repair, and/or replace actuators.
f. Inspect actuators for dents, cracks, damage, and leakage; determine needed action.

Master Medium/Heavy Diesel Truck Service Technology (MTST) Section B 470471

The entire description and all Tasks/Standards for the Master Medium/Heavy Diesel Truck Service Technology (MTST) Sections A and B are listed in the Master Medium/Heavy Diesel Truck Service Technology (MTST) Section A. **Courses and Standards/Tasks in A and B can be completed in any sequence.**

Mechanical Concepts 470406

This course introduces the student to the basic fundamentals of precision measurement and its application to the industrial setting.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Measure with a metric rule.
2. Read an English Vernier caliper and height gauge scale.
3. Read a metric Vernier caliper and height gauge scale.
4. Read an English micrometer.
5. Read a metric micrometer.
6. Identify and use hole and plug gauges to check hole diameters.
7. Identify and use thread gauges to check thread dimensions.
8. Read and use various dial indicators.
9. Identify and install fasteners.
10. Identify, use, and maintain hand tools.
11. Identify and use taps and dies.
12. Identify and use proper rigging methods.
13. Identify and use flaring tools.
14. Identify and use a torque wrench.

Powertrain (Diesel) and Lab 470427

This course emphasizes the theory and principles of the power train systems. Students learn to diagnose and repair components such as clutches, drive lines, propeller shafts, differentials, and final drives. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and test and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.
2. Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies); check pedal height and travel; perform needed action.
3. Inspect, adjust, repair, or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.
4. Inspect, adjust, lubricate, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.
5. Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc.
6. Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.
7. Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action.
8. Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms.
9. Inspect and replace pilot bearing.
10. Inspect flywheel mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action.
11. Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed action.
12. Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.
13. Identify causes of transmission noise, shifting, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action.
14. Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.
15. Inspect and replace transmission mounts, insulators, and mounting bolts.

16. Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed.
17. Check transmission fluid level and condition; determine needed service; add proper type of lubricant.
18. Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.
19. Remove and reinstall transmission.
20. Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action.
21. Inspect transmission oil filters and coolers; replace as needed.
22. Inspect speedometer components; determine needed action.
23. Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action.
24. Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action.
25. Inspect and test transmission temperature gauge and sensor/sending unit; determine needed action.
26. Inspect and test operation of automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses; determine needed action.
27. Inspect and test operation of automated mechanical transmission electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines; determine needed action.
28. Use appropriate diagnostic tools and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action.
29. Inspect and test operation of automatic transmission electronic shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses.
30. Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses.
31. Use appropriate diagnostic tools and procedures to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action.
32. Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action.
33. Inspect, service, ore replace driveshaft, slip joints, yokes, drive flanges, and universal joints, driveshaft boots and seals, and retaining hardware; check phasing of all shafts.
34. Inspect driveshaft center support bearings and mounts; determine needed action.
35. Measure driveline angles; determine needed action.
36. Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action.
37. Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals.

38. Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.
39. Remove and replace differential carrier assembly
40. Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.
41. Inspect and replace components of locking differential case assembly.
42. Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.
43. Measure ring gear runout; determine needed action.
44. Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.
45. Measure and adjust drive pinion bearing preload.
46. Measure and adjust drive pinion depth.
47. Measure and adjust side bearing preload and ring gear backlash.
48. Check and interpret ring gear and pinion tooth contact pattern; determine needed action.
49. Inspect, adjust, or replace ring gear thrust block/screw.
50. Inspect power divider (inter-axle differential) assembly; determine needed action.
51. Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pings, lines, hoses, fittings, and controls.
52. Inspect, repair, or replace drive axle lubrication system; pump, troughs, collectors, slingers, tubes, and filters.
53. Inspect and replace drive axle shafts.
54. Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action.
55. Identify causes of drive axle wheel bearing noise and check for damage; perform needed action.
56. Inspect and test drive axle temperature gauge and sending unit/sensor; determine needed action.
57. Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; inspect and replace retaining hardware; adjust drive axle wheel bearings.
58. Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action.
59. Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushings, pivots, and levers.
60. Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed.
61. Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed.
62. Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys; replace as needed.
63. Inspect and/or replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear end play (where applicable); replace as needed.
64. Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed.

65. Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed.
66. Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed.

Precision Measurement 470546

This course introduces the student to the basic fundamentals of precision measurement and its application in the industrial setting.

Recommended Grade Level: 10 - 12

Recommended Credit: .5

Students will:

1. Measure with an English fraction rule.
2. Measure with an English decimal rule.
3. Measure with a metric steel rule.
4. Read an English Vernier caliper and height gauge scale.
5. Read a metric Vernier caliper and height gauge scale.
6. Read an English micrometer.
7. Read a metric micrometer.
8. Assemble English gauge blocks to specified measurements.
9. Assemble metric gauge blocks to specified measurements.
10. Use hole and plug gauges to check hole diameters.
11. Use thread gauges to check thread dimensions.
12. Read and use various dial indicators.
13. Identify pneumatic, electrical, electronic, and optical comparators.

Preventive Maintenance Lab 470403

This course provides the student with instruction on preventive maintenance practices, scheduled procedures, documents, DOT-required record system, and determining the needs for repair. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: .5

Students will:

1. Check engine starting/operation (including unusual noises, vibrations, and exhaust smoke); record idle and governed rpm.
2. Inspect vibration damper.
3. Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.
4. Check engine oil level and condition; check dipstick seal.
5. Inspect engine mounts for looseness and deterioration.
6. Check engine for oil, coolant, air, fuel, and exhaust leaks (Engine Off and Running).
7. Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.
8. Check fuel tanks, mountings, lines, caps, and vents.
9. Drain water from fuel system.
10. Service waster separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.
11. Check exhaust system mountings for looseness and damage.
12. Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and after-treatment devices, if equipped.
13. Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.
14. Inspect turbocharger for leaks; check mountings and connections.
15. Check operation of engine compression/exhaust brake.
16. Service ore replace air filter as needed; check and reset air filter restriction indicator.
17. Check operation of fan clutch.
18. Inspect radiator (including air flow restriction, leaks, and damage) and mountings.
19. Inspect fan assembly and shroud.
20. Pressure test cooling system and radiator cap.
21. Inspect coolant hoses and clamps.
22. Inspect coolant recovery system.

23. Check coolant for contamination, additive package concentration, and protection level (freeze point).
24. Service coolant filter.
25. Inspect water pump for leaks and bearing play.
26. Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.
27. Take an engine oil sample.
28. Inspect key condition and operation of ignition switch.
29. Check warning indicators.
30. Check instruments; record oil pressure and system voltage.
31. Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable).
32. Check HVAC controls.
33. Check operation of all accessories.
34. Using diagnostic tool or on-board diagnostic system, retrieve engine monitoring information; check and record diagnostic codes and trip/operational data (including engine, transmission, ABS, and other systems).
35. Check operation of electric/air horns and reverse warning devices.
36. Check condition of spare fuses, triangles, fire extinguisher, and all required decals.
37. Inspect seat belts and sleeper restraints.
38. Inspect wiper blades and arms.
39. Check operation of wiper and washer.
40. Inspect windshield glass for cracks or discoloration; check sun visor.
41. Check seat condition, operation, and mounting.
42. Check door glass and window operation.
43. Inspect steps and grab handles.
44. Inspect mirrors, mountings, brackets, and glass.
45. Record all observed physical damage.
46. Lubricate all cab and hood grease fittings.
47. Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.
48. Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.
49. Inspect A/C condenser and lines for condition and visible leaks; check mountings.
50. Inspect A/C compressor and lines for condition and visible leaks; check mountings.
51. Check A/C system condition and operation; check A/C monitoring system, if applicable.
52. Check HVAC air inlet filters and ducts; service as needed.
53. Inspect batter boxes, covers, and mountings.
54. Inspect battery hold-downs, connections, cables, and cable routing; service as needed.
55. Check/record battery state-of-charge (open circuit voltage) and condition.
56. Perform battery test (load and/or capacitance).
57. Inspect starter, mounting, and connections.
58. Engage starter; check for unusual noises, starter drag, and starting difficulty.
59. Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action.
60. Perform alternator output tests.

61. Check operation of interior lights; determine needed action.
62. Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.
63. Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.
64. Check operation of parking brake.
65. Record air governor cut-out setting (psi).
66. Check operation of air reservoir/tank drain valve.
67. Check air system for leaks (brakes released).
68. Check air system for leaks (brakes applied).
69. Test one-way and double-check valves.
70. Check low air pressure warning devices.
71. Check air governor cut-in pressure.
72. Check emergency (spring) brake control/modulator valve, if applicable.
73. Check tractor protection valve.
74. Test air pressure build-up time.
75. Inspect coupling air lines, holders, and gladhands.
76. Check brake chambers and air lines for secure mounting and damage.
77. Check operation of air drier.
78. Inspect and record brake shoe/pad condition, thickness, and contamination.
79. Inspect and record condition of brake drums/rotors.
80. Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.
81. Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke.
82. Lubricate all brake component grease fittings.
83. Check condition and operation of hand brake (trailer) control valve.
84. Perform antilock brake system (ABS) operational system self-test.
85. Drain air tanks and check for contamination.
86. Check condition of pressure relief (safety) valves.
87. Check master cylinder fluid level and condition.
88. Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.
89. Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.
90. Check operation of hydraulic system; pedal travel, pedal effort, pedal feel (drift).
91. Inspect calipers for leakage and damage.
92. Inspect power brake assist system (booster), hoses and control valves; check brake assist reservoir fluid level and condition.
93. Inspect and record brake lining/pad condition, thickness, and contamination.
94. Inspect and record condition of brake rotors.
95. Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.
96. Check operation of clutch, clutch brake, and gearshift.
97. Check clutch linkage/cable for looseness or binding, if applicable.
98. Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.

99. Check clutch adjustment; adjust as needed.
100. Check transmission case, seals, filter, hoses, and cooler for cracks and leaks.
101. Inspect transmission breather.
102. Inspect transmission mounts.
103. Check transmission oil level, type, and condition.
104. Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.
105. Inspect axle housing(s) for cracks and leaks.
106. Inspect axle breather(s).
107. Lubricate all drive train grease fittings.
108. Check drive axle(s) oil level, type, and condition.
109. Change drive axle(s) oil and filter; check and clean magnetic plugs.
110. Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.
111. Change transmission oil and filter; check and clean magnetic plugs.
112. Check interaxle differential lock operation.
113. Check range shift operation.
114. Check steering wheel operation for free play or binding.
115. Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.
116. Change power steering fluid and filter.
117. Inspect steering gear for leaks and secure mounting.
118. Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.
119. Check kingpin for wear.
120. Check wheel bearings for looseness and noise.
121. Check oil level and condition in all non-drive hubs; check for leaks.
122. Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.
123. Inspect shock absorbers for leaks and secure mounting.
124. Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.
125. Check and record suspension ride height.
126. Lubricate all suspension and steering grease fittings.
127. Check toe setting.
128. Check tandem axle alignment and spacing.
129. Check axle locating components (radius, torque, and/or track rods).
130. Inspect tires for wear patterns and proper mounting.
131. Inspect tires for cuts, cracks, bulges, and sidewall damage.
132. Inspect valve caps and stems; replace as needed.
133. Measure and record tread depth; probe for imbedded debris.
134. Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.
135. Check for loose lugs; check mounting hardware condition; service as needed.
136. Re-torque lugs in accordance with manufacturers' specifications.
137. Inspect wheels for cracks or damage.
138. Check tire matching (diameter and tread) on dual tire installations.

139. Inspect fifth wheel mounting, bolts, air lines, and locks.
140. Test operation of fifth wheel locking device; adjust if necessary.
141. Check quarter fenders, mud flaps, and brackets.
142. Check pintle hook assembly and mounting.
143. Lubricate all fifth wheel grease fittings and plate.
144. Inspect frame and frame members for cracks and damage.

Special Problems I (Diesel) 470477

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught in previous Diesel courses. The instructor will teach students how to deal with real world problems that arise when repairing Medium/Heavy Truck vehicles subjected to various types of customer road use.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Problems II (Diesel) 470478

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught in previous Diesel courses. The instructor will teach students how to deal with real world problems that arise when repairing Medium/Heavy Truck vehicles subjected to various types of customer road use.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Problems III (Diesel) 470479

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught in previous Diesel courses. The instructor will teach students how to deal with real world problems that arise when repairing Medium/Heavy Truck vehicles subjected to various types of customer road use.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Problems IV (Diesel) 470480

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught in previous Diesel courses. The instructor will teach students how to deal with real world problems that arise when repairing Medium/Heavy Truck vehicles subjected to various types of customer road use.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Special Topics – Diesel Technology 470499

This course is designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught in previous Diesel courses. The instructor will teach students how to deal with real world problems that arise when repairing Medium/Heavy Truck vehicles subjected to various types of customer road use.

Recommended Grade Level: 9 - 12

Recommended Credit: .5 - 1

Students will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Steering and Suspension (Diesel) 470424

The theory and operation of steering and suspension systems are presented including manual steering, power steering, springs and supports, steering linkage and alignment. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and test and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Course only available for Programs still certified under the 2014 ASE/NATEF Medium/Heavy Duty Truck Standards. Course will be phased out 6/30/2023.

Recommended Grade Level: 11 - 12

Recommended Credit: 1

Students will:

1. Identify causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.
2. Inspect and service steering shaft U-joint(s); slip joints, bearings, bushings, and seals; phase shaft.
3. Check and adjust cab mounting and ride height.
4. Center the steering wheel as needed.
5. Disable and enable supplemental restraint system (SRS) in accordance with manufacturer's procedures.
6. Identify causes of power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recover, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action.
7. Determine recommended type of power steering fluid; check level and condition; determine needed action.
8. Flush and refill power steering system; purge air from system.
9. Perform power steering system pressure, temperature, and flow tests; determine needed action.
10. Inspect, service ore replace power steering reservoir including filter, seals, and gaskets.
11. Inspect power steering pump drive gear and coupling; replace as needed.
12. Inspect, adjust, or replace power steering pump, mountings, and brackets.
13. Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.
14. Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings.
15. Inspect and align pitman arm; replace as needed.
16. Check and adjust steering (wheel) stops.
17. Inspect and lubricate steering arms and linkages.
18. Inspect front axles and attaching hardware; determine needed action.

19. Inspect and service kingpin, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.
20. Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.
21. Inspect leaf springs, center bolts, clips, pins and bushings, shackles, slippers, insulators, brackets, and mounts; determine needed action.
22. Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action.
23. Inspect tandem suspension equalizer components; determine needed action.
24. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed.
25. Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.
26. Measure ride height; determine needed action.
27. Identify rough ride problems; determine needed action.
28. Identify causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems; adjust or repair as needed.
29. Check camber; determine needed action.
30. Check caster; adjust as needed.
31. Check toe; adjust as needed.
32. Check rear axle(s) alignment (thrustline/centerline) and tracking; adjust or repair as needed.
33. Identify turning/Ackerman angle (toe-out-on-turns) problems; determine needed action
34. Check front axle alignment (centerline); adjust or repair as needed.
35. Identify tire wear patterns, check tread depth and pressure; determine needed action.
36. Identify wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.
37. Remove and install steering and drive axle wheel/tire assemblies.
38. Inspect tire for proper application (size, load range, position, and trade design); determine needed action.
39. Inspect wheel/rims for proper application, load range, size, and design; determine needed action.
40. Check operation of tire pressure monitoring system; determine needed action.
41. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware.
42. Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.
43. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.
44. Inspect, install, ore repair frame hangers, brackets, and cross members in accordance with manufacturer’s recommended procedures.
45. Inspect, repair, or replace pintle hooks and draw bars.
46. Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.
47. Adjust manual and automatic steering gear poppet/relief valves.
48. Inspect drag link (relay rod) and tie rod ends (ball and adjustable socket type); adjust or replace as needed.

49. Inspect steering arm and levers, and linkage pivot joints; replace as needed.
50. Inspect clamps and retainers on cross tube/relay rod/centerlink/tie rod; position or replace as needed.
51. Inspect torque arms, bushings, and mounts; determine needed action.