Middle School Science, Technology, Engineering, and Mathematics (STEM)

Program of Studies
2017-2018

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Middle School STEM Courses

Course Title	Course Code	Recommended Grade Level		
		6	7	8
Automation and Robotics (PLTW)	219910	x	x	x
Design and Modeling (PLTW)	219909	x	x	x
Energy and the Environment (PLTW)	219914	x	x	x
Exploration of Computer and Graphic Communication Technology	210122	x	x	x
Exploration of Construction Technology	210121	x	x	x
Exploration of Manufacturing Technology	210120	x	x	x
Exploration of Power Energy and Transportation Technology	210119	x	x	x
Exploring Technology	210127	x	x	x
Flight and Space (PLTW)	219912	x	x	x
Green Architecture (PLTW)	219915	x	x	x
Introduction to Computer Science I (PLTW)	219918	x	x	x
Introduction to Computer Science II (PLTW)	219919	x	x	x
Invention and Innovation	210101	x	x	x
Magic of Electrons (PLTW)	219913	x	x	x
Medical Detectives (PLTW)	219916	x	x	x
Science and Technology (PLTW)	219911	x	x	x
Technological Systems	210103	x	x	x

K-12 Science, Technology, Engineering and Math (STEM) Pathway

Elementary School STEM Program
School districts are encouraged to explore the concept of a K-12 STEM pipeline. This career pathway would facilitate exploration, the attainment of knowledge and skills necessary for informed participation and gainful employment in a technologically dependent society. This pipeline may include a recommended sequence of courses that would allow integration and interdisciplinary instruction of important concepts. Beginning this pipeline at the elementary level could help the students focus their learning.

Middle School STEM Program
Programs in the middle school provide an exploration into STEM and how it connects skills from other academic disciplines. Students experience the design process as they invent devices to solve various problems. Students learn of system requirements, processes and controls as they wrestle with trade-offs due to design constraints. Students apply scientific and mathematical knowledge as they analyze data to predict performance. Students learn the proper and safe operation of some basic tools as their ideas begin to take shape. Through these experiences, students begin to understand the forces that drive our technological society and how these forces can be controlled and directed. Instructional approaches include problem solving/design briefs where students build projects, small/large group instruction, discussion, research, student presentations, and other successful pedagogy. **STEM at the middle school level should include a local chapter of the Technology Student Association (TSA) and can incorporate many of the TSA activities within the curriculum.**

A middle school STEM course is generally offered for six to eighteen weeks for a single class period each day. Alternative schedules that provide for equivalent contact hours may also be implemented. A total program of STEM consists of a minimum of three course offerings, one for each grade level (6-8).

High School Engineering Program
The U.S. has approximately 1.6 million engineering jobs that pay $42 per hour in median wages. Civil engineers account for the most jobs of any engineering field (274,000 in 2014), followed closely by mechanical engineers (264,000) and industrial engineers (229,000). Those three engineering jobs, plus electrical engineers and electronics engineers, make up two-thirds of the American engineering workforce.
http://www.forbes.com/sites/emsi/2014/09/12/the-most-in-demand-and-oldest-engineering-jobs/#6f57082c4b4a

The Commonwealth of Kentucky has created high school engineering pathways to excite and drive interest in these top Engineering fields. Special attention is also paid to Aerospace Engineering as this is Kentucky's top export and only second to Washington State in export dollars.

High School Engineering Technology Program
This program of studies includes the practical application of science and engineering and exposes students to a wide range of real world problems. The Commonwealth of Kentucky offers a wide array of Engineering Technology and Science, Technology, Engineering and Math (STEM) related High School Career Pathways to create a future workforce ready for industry needs.

Career and Technical Education/Engineering Hybrid Pathways
Project Lead The Way (PLTW) and the Office of Career and Technical Education (CTE) worked together to create further opportunities for students that are enrolled in secondary CTE specific programs. These are referred to as Hybrid pathways that consist of courses within the specific program area with the addition of selected Engineering courses relative to that career area. Since their inception, the hybrid pathways now include nonPLTW engineering courses to allow expanded access across the Commonwealth. These pathways blend 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 and to meet the demands of industry for individuals with both technical and engineering knowledge and skills.

Student Organizations
Participation in Technology Student Association (TSA) provides a vehicle for students to employ higher order thinking skills, to interact with industry individuals to further enhance their leadership skill through their participation in regional, state and national competitive events and local activities.

Imagine an activity so captivating that your students spend hours working on it after school for weeks at a time. That's what happens when TSA members engage in TSA's competitions. Only TSA members have the opportunity to compete at exciting regional, state and national conferences. Expert judging by technology educators and industry representatives inspires the best from participants. Members are rewarded not only with medals or trophies, but also with memories of the camaraderie and the challenge brought on by TSA.

STEM at the middle school level as well as Engineering and Engineering Technology at the high school level should include a local chapter of Technology Student Association (TSA) and can incorporate many of the TSA activities within the curriculum.

Engineering Vs. Engineering Technology

According to the Accreditation Board for Engineering and Technology Inc. (ABET); engineering and engineering technology are separate but closely related professional areas that differ in:

- **Curricular Focus** – Engineering programs often focus on theory and conceptual design, while engineering technology programs usually focus on application and implementation. Engineering programs typically require additional, higher-level mathematics, including multiple semesters of calculus and calculus-based theoretical science courses, while engineering technology programs typically focus on algebra, trigonometry, applied calculus, and other courses that are more practical than theoretical in nature.
- **Career Paths** – Graduates from engineering programs are called engineers and often pursue entry-level work involving conceptual design or research and development. Many continue on to graduate-level work in engineering. Graduates of four-year engineering technology programs are called technologists, while graduates of two-year engineering technology programs are called technicians. These professionals are most likely to enter positions in sectors such as construction, manufacturing, product design, testing, or technical services and sales.

http://www.abet.org/accreditation/new-to-accreditation/engineering-vs-engineering-technology/

Engineering and Engineering Technology – What is the difference?
This question is asked repeatedly by graduating high school seniors who are considering the field of engineering as a career. They are told that engineering is science-oriented, stressing mathematics, natural and engineering science, engineering design, and the development of engineering research competencies. On the other hand, engineering technology is practice-oriented, stressing applications of engineering science, engineering design, and laboratory experience competencies. The potential student in engineering education is still confused because of the apparent overlap in the definitions. The student must understand that the field of engineering comprises a broad spectrum of occupations requiring different abilities, interest and skills. Both engineering and engineering technology are viable professional paths that lead to rewarding and successful careers. It is important for students to carefully assess their abilities, interests and personal career objectives before deciding between engineering and engineering technology. The student should study the following comparisons in order to decide which career path best fits his or her abilities and interests. All too often, graduating high school seniors enroll in engineering curriculums without realizing there is another alternative in which they could be more successful, during both academic preparation and the career that follows.

According to Payscale.com which gathers salary and employment data for the federal government, the average starting salaries for both Engineering graduates as well as Engineering Technology graduates are almost identical, hovering around $47k* annually as of December 2016. *updated to reflect current pay

Post-Secondary Comparison of Engineering and Engineering Technology

This comparison list is modeled from a brochure, "Mechanical Engineering and Mechanical Engineering Technology, Which Path Will You Take", published by the American Society of Mechanical Engineers.

ENGINEERING	ENGINEERING TECHNOLOGY
Program Guide Characteristics	
An innovator—one who is able to interweave a knowledge of advanced mathematics, the natural and engineering sciences, and engineering principles and practices with considerations of economic, social, environmental, and ethical issues to create new systems and products.	A doer or implementer—one who is able to apply a basic knowledge of mathematics, the natural and engineering sciences, current engineering practices, and an understanding of economic principles of the solution of design problems and to the operation or testing of engineering and manufacturing systems.
Program Objectives	
To provide the knowledge necessary to design and manufacture state-of-the-art products and systems needed to meet the current and future needs of society. To provide the knowledge required to apply state-of-the-art techniques and designs to meet the current needs of society.	To provide the knowledge required to apply state-of-the-art techniques and designs to meet the current needs of society.
Program Emphasis	
Emphasis is on developing methods of analysis and solutions for open-ended design problems.	Emphasis is on applying current knowledge and practices to the solution of specific technical problems.
Expertise Objectives	
To develop conceptual abilities.	To develop application abilities.
Program Length	
Four years.	Four years. Transfer students from community colleges may take longer if they do not have basic math and science courses in freshman and sophomore years.

ENGINEERING	ENGINEERING TECHNOLOGY

Courses in Major Field	
Engineering students usually do not begin major field of study until the latter part of sophomore year or junior year.	Engineering technology students begin major field of study in the freshman year.

Degrees Awarded	
B.S. in Engineering	B.S. in Engineering Technology

Academic Terminology	
Graduates are referred to as engineers.	Graduates are referred to as engineering technologists. Job titles after entering industry will be "engineers" more often than not.

Program Basis	
The equivalent of one full year of mathematics and basic science courses provides the foundation for the program that is calculus based.	The equivalent of three-quarters of a year of mathematics and basic science. Engineering Technology programs are algebra-based, but calculus usage is required as a subject.

Emphasis of Technical Courses	
Engineering courses stress the underlying theory of the subject matter.	Technology courses stress the application of technical knowledge and methods in the solution of current industrial type problems.

Emphasis of Laboratory Courses	
Laboratory courses provide an intensive overview of experimental methods and of the related underlying theories.	Laboratory courses, an integral component, stress practical design solutions as well as manufacturing and evaluation techniques appropriate for industrial type problems.

Technical Design Emphasis	
General design principles, applicable to a wide variety of problem situations, are developed.	Current design procedures of a complex, but well-established nature are developed and applied to problems in a specialized technical area.

Transfer Potential	
Transfer to a technology program from an engineering curriculum is possible with a minimum loss of credits and time.	It is generally not possible to transfer to an engineering curriculum from a technology program without a significant loss of credits and time.

ENGINEERING	ENGINEERING TECHNOLOGY

Typical Aspirations of the New Graduate	
The engineering graduate entering industry would most likely aspire to an entry-level position in conceptual design, systems engineering, manufacturing, or product research and development.	A graduate entering industry would most likely aspire to an entry-level position in product design, development, testing, technical operations, or technical services and sales.

Technical Interest	
The engineering graduate is relatively broad and has an analytical, creative mind challenged by open-ended technical problems.	A graduate is relatively specialized and has an applications orientation, challenged by specific technical problems.

Adaptability to Current Industrial Practices	
An engineering graduate typically requires a period of "internship" since engineering programs stress fundamentals.	A graduate is prepared to immediately begin technical assignments since technology programs stress current industrial practices and design procedures.

Mobility	
Many engineers move into management positions.	The majority of engineering technologists move into industrial supervisory positions. Many move into management positions.

Professional Registration	
Graduates of engineering schools are eligible to become registered professional engineers in all states by a process of examination and documentation of experiences.	Graduates of engineering technology schools may become professionally certified in their specific areas of expertise. Technologists may become registered professional engineers in many states; however, the requirements are usually different than those for engineers.

National Accreditation	
Accredited by the Accreditation Board for Engineering and Technology—Engineering Accreditation Commission (EAC of ABET.)	Accredited by the Accreditation Board for Engineering and Technology—Technology Accreditation Commission (TAC of ABET.)

Graduate Education Opportunities	
Graduate study in engineering as well as other areas is available for qualified students having a B.S. in engineering.	Graduate study in technology is limited to a few universities and entrance to graduate engineering programs is most often difficult. Advanced degrees in technical education and business are possible.

https://www.suu.edu/cose/et/pdf/eng-vs-et.pdf

Kentucky High School Pathways

Engineering Pathways

- Aerospace Engineering (14.0201.01)
- Civil Engineering (14.0801.00)
- Electrical/Electronics Engineering (14.1001.00)
- Industrial/Mechanical Engineering (14.3501.00)

Career and Technical Education (CTE) and Engineering Hybrid Pathways

- Automotive Engineering (15.0803.00)
- Computerized Manufacturing and Machining (CMM) Engineering (48.0510.00)
- Construction Architectural Engineering (15.0101.02)
- Design Engineering (15.1304.00)
- Electrical Construction Engineering (15.0303.00)
- Fabrication Engineering (14.1901.00)
- Fluid Power Engineering (15.1103.00)
- Industrial Maintenance/Electrical Engineering (14.4101.00)
- Structural Engineering (14.0803.00)
- Welding Engineering (15.0614.00)
- Wood Manufacturing Engineering (03.0509.00)

Engineering Technology Pathways

- Civil Architecture and Construction Technology (15.0101.01)
- Energy Management (15.0503.02)
- Engineering Technology Design (15.1302.00)
- Graphic and Digital Communications (10.0105.00)
- Manufacturing Engineering Technology (15.0613.00)
- Robotics and Automation (15.0405.00)
- Sustainability and Energy Application Technician (15.0503.01)

Flight and Aviation Pathways

- Flight and Aeronautics (49.0102.00)
- Aircraft Maintenance Technician (47.0607.00)

Project Lead The Way (PLTW) Gateway Curriculum

Access to curriculum for PLTW Gateway Curriculum requires a District/School agreement with PLTW. Updated course content and information can be obtained from Project Lead The Way (PLTW) via: https://www.pltw.org/our-programs/pltw-gateway-curriculum.

Automation and Robotics (PLTW) **Valid Course Code: 219910**
Course Description: Students trace the history, development, and influence of automation and robotics as they learn about mechanical systems, energy transfer, machine automation, and computer control systems. Students use the VEX Robotics® platform to design, build, and program real-world objects such as traffic lights, toll booths, and robotic arms. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**
Design and Modeling (PLTW) **Valid Course Code: 219909**
Course Description: Students discover the design process and develop an understanding of the influence of creativity and innovation in their lives. They are then challenged and empowered to use and apply what they've learned throughout the unit to design a therapeutic toy for a child who has cerebral palsy. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**
Energy and The Environment (PLTW) **Valid Course Code: 219914**
Course Description: Students are challenged to think big and toward the future as they explore sustainable solutions to our energy needs and investigate the impact of energy on our lives and the world. They design and model alternative energy sources and evaluate options for reducing energy consumption. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**
Flight and Space (PLTW) **Valid Course Code: 219912**
Course Description: The exciting world of aerospace comes alive through Flight and Space. During this unit, students delve into the history of flight and space, discover the science behind aeronautics, and explore traveling and living in space. Students are then challenged to use their knowledge to design, build, and test an airfoil. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**
Green Architecture (PLTW) **Valid Course Code: 219915**
Course Description: Today's students have grown up in an age of "green" choices. In this unit, students learn how to apply this concept to the fields of architecture and construction by exploring dimensioning, measuring, and architectural sustainability as they design affordable housing units using Autodesk's® 3D architectural design software. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Introduction to Computer Science I (PLTW)

Valid Course Code: 219918

Course Description: In this unit, students discover the principles of this fast-growing field by focusing on creativity and an iterative design process as they create their own basic apps using MIT App Inventor. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Introduction to Computer Science II (PLTW)

Valid Course Code: 219919

Course Description: Students continue to explore the fundamentals of the stimulating career path of computer science. They venture into text-based programming through Python and, in the final problem, develop an app to crowdsource and analyze data on a topic of their interest. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Magic of Electrons (PLTW)

Valid Course Code: 219913

Course Description: Through hands-on projects, students explore electricity, the behavior and parts of atoms, and sensing devices. They learn knowledge and skills in basic circuitry design, and examine the impact of electricity on the world around them. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Medical Detectives (PLTW)

Valid Course Code: 219916

Course Description: Students play the role of real-life medical detectives as they analyze genetic testing results to diagnose disease and study DNA evidence found at a "crime scene." They solve medical mysteries through hands-on projects and labs, investigate how to measure and interpret vital signs, and learn how the systems of the human body work together to maintain health. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Science and Technology (PLTW)

Valid Course Code: 219911

Course Description: Science impacts the technology of yesterday, today, and the future. Students apply the concepts of physics, chemistry, and nanotechnology to STEM activities and projects, including making ice cream, cleaning up an oil spill, and discovering the properties of nano-materials. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Connections

- Kentucky Technology Student Association (KYTSA)
- Kentucky Academic Standards
- Standards for Technological Literacy

Exploration of Computer and Graphic Communication Technology
Valid Course Code: 210122

Course Description: An exploratory course designed to provide students the skills and knowledge that are performed in the computer and communication industries. The types of activities may include but not limited to developing images, digital photography, desktop publishing, computer aided design, mechanical drafting, and printing, computer animation, sublimation, screen printing, bindery, audio/video production, and file management through laboratory experiences. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Content/Process

Students will:

1. Demonstrate the use of an engineering design process to solve real-world problems.
2. Demonstrate an understanding of the history of scientific principles, and potential careers in the audio broadcasting industry.
3. Develop an appreciation how communication technology has impacted our society.
4. Create graphic design projects with the use of various software programs.
5. Utilize the interactive (team) process for engineering design.
6. Students will utilize basic principles of design through the use of mechanical drawing.
7. Students will combine graphics, audio and video to create a multimedia presentation.
8. Explore design techniques and develop basic skills with the use of CADD programs.
9. Identify current and emerging careers related to construction technology.
10. Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.

Connections

- Kentucky Technology Student Association (KYTSA)
- Kentucky Academic Standards
- Standards for Technological Literacy

Exploration of Construction Technology
Valid Course Code: 210121

Course Description: An exploratory course designed to investigate the types of activities performed in the construction industry and through laboratory experiences students explore the skills and technologies of this industry. Content includes the application of technology; the design of products and services; emerging and innovative technologies; safety and maintenance of technology; marketing; and technology-related career explorations. Activities may include computer aided design, architectural drafting, building models of buildings, using construction tools, machines, to design and building simple structures. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Content/Process

Students will:

1. Demonstrate the use of an engineering design process to solve real-world problems.
2. Demonstrate an understanding of history of construction.
3. Develop and appreciation of why construction technology is important to our society.
4. Describe the essential systems and processes involved in construction.
5. Identify materials and resources used in construction design.
6. Construct and test structural members with stress testing devices.
7. Utilize the interactive (team) process for engineering design.
8. Students will utilize basic principles of design through the use of technical drawings.
9. Explore design techniques and develop basic skills with the use of CAD programs.
10. Identify current and emerging careers related to construction technology.
11. Develop a safe and functional level of skill, efficiency and effective use of technological tools, machines, instrumentation, material and processes.

Connections

- Kentucky Technology Student Association (KYTSA)
- Kentucky Academic Standards
- Standards for Technological Literacy

Exploration of Manufacturing Technology
Valid Course Code: 210120

Course Description: An exploratory course designed to investigate the types of activities performed in the manufacturing industry and through laboratory experiences students explore the skills and technologies of this industry. Content includes the application of technology; the design of products and services; emerging and innovative technologies; safety and maintenance of technology; and career explorations. Activities may include computer aided drafting, manufacturing parts, CNC programming, computer control, and robotics.
Participation in Kentucky Technology Student Association will greatly enhance instruction.

Content/Process

Students will:

1. Demonstrate the use of an engineering design process to solve real-world problems.
2. Demonstrate an understanding of the history of manufacturing.
3. Demonstrate an understanding of the social impact of manufacturing.
4. Describe the essential systems and processes involved in manufacturing.
5. Identify materials and resources used in manufacturing.
6. Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.
7. Utilize the interactive (team) process for engineering design.
8. Use Instruments to collect and analyze data.
9. Perform a pre-planned introductory manufacturing activity applying correct safety procedures, appropriate use of materials and processing operations.
10. Identify current and emerging careers related to manufacturing technology.
11. Develop a safe and functional level of skill, efficiency, and effective use of technological tools, machines, instrumentation, material, and processes.

Connections

- Kentucky Technology Student Association (KYTSA)
- Kentucky Academic Standards
- Standards for Technological Literacy

Exploration of Power Energy and Transportation Technology
Valid Course Code: 210119

Course Description: This course allows for exploration in the many phases of Power Energy and Transportation through hands-on activities. This program of study facilitates STEM principles to be applied in real world situations. This course should include Aviation and Aerospace, Transportation Systems, Power and Energy, and Research. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Content/Process

Students will:

1. Demonstrate the use of an engineering design process to solve real-world problems.
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. Use instruments to collect and analyze data.
4. Identify current and emerging careers related to technology.
5. Develop competencies in the safe, efficient, and effective use of tools, machines, materials, and processes.
6. Independently and cooperatively explore areas of technology related to power, energy and transportation systems in order to discover technical abilities career interest and future educational directions.
7. Develop a safe and functional level of skill in the use of technological tools, machines, and instrumentation, material and processes.
8. Recognize and appreciate the impact and potential of technology so that students can exercise some control over the uses and consequences of technology.

Connections

- Kentucky Technology Student Association (KYTSA)
- Kentucky Academic Standards
- Standards for Technological Literacy

Exploring Technology
Valid Course Code: 210127

Course Description: Students develop an understanding of the progression and scope of technology through exploratory experiences. In group and individual activities, student experience ways in which technological knowledge and processes contribute to effective design and solutions to technological problems. Students participate in design activities to understand how criteria, constraints, and processes affect designs. Brainstorming, visualizing, modeling, constructing, testing, and refining designs provide first hand opportunities for students to understand the uses and impacts of innovations. Students develop skills in communicating design information and reporting results. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Content/Process

Students will:

1. Demonstrate the use of an engineering design process to solve real-world problems.
2. Identify and become aware of ways technology has been used to meet human needs in the home, school, community, and workplace.
3. Use technological terminology correctly.
4. Explore technological concepts and processes in the contexts of communication, transportation, manufacturing, construction, power and energy, medical, agriculture and bio-related technological systems.
5. Develop and use problem solving and decision making skills to invent, design, and modify devices and systems.
6. Use tools, machines, and materials in a safe, efficient, and effective manner.
7. Gather, analyze, and communicate technical information by measuring, reading, and analyzing drawings and other technical sources.
8. Develop technical writing skills using appropriate forms, conventions and styles to communicate ideas and information.
9. Understand that computers and software are versatile tools used to collect, organize, process, and communicate information and ideas.
10. Explore employability and social skills relative to careers.
11. Analyze the evolution of technological systems and their impacts on society.
12. Develop and demonstrate strategies and work habits that will lead to success and prepare the student for future careers in a technological world.

Connections

- Kentucky Technology Student Association (KYTSA)
- Kentucky Academic Standards
- Standards for Technological Literacy

Invention and Innovation
Valid Course Code: 210101

Course Description: This course provides students with opportunities to apply the design process in the invention or innovation of a new product, process, or system, In this course, students will learn all about invention and innovation. They will have opportunities to study the history of Invention and Innovations, including their impacts on society. They will learn about the core concepts of technology, and about the various approaches to solving problem, including engineering design and experimentation. Finally students learn about how various Invention and Innovations impact their lives. Students participate in engineering-design activities to understand how criteria, constraints, and processes affect designs. Students are involved in activities where they learn about brainstorming, visualizing, modeling, constructing, testing, experimenting, and refining designs. Students also develop skills in researching for information, communicating design information, and reporting results. This course will make extensive use of a laboratory environment through a variety of instructional strategies. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Content/Process

Students will:

1. Demonstrate the use of an engineering design process to solve real-world problems.
2. Define technology and use technological terminology correctly.
3. Identify and become aware of ways technology has been used to satisfy human needs and environmental concerns.
4. Evaluate the impacts of technological Invention and Innovations on people, society, culture, and the environment.
5. Develop and use problem solving and decision making skills (brainstorming, visualizing, modeling, constructing, testing, and refining, etc.) to invent, design, create, and modify devices and systems.
6. Implement elements of form and function to the design process.
7. Use tools, machines, and materials in a safe, efficient, and effective manner.
8. Identify and analyze current and emerging issues (e.g., ethical, social, legal, environmental, political, and privacy) related to technology.
9. Describe intended and unintended impacts of the application of technological solutions.
10. Identify appropriate and inappropriate applications of technology.
11. Analyze how and why societal demands impact invention and innovation.
12. Identify that a product, system, or environment developed for one setting may be applied to another setting.
13. Understand that innovations are alterations of previous inventions.
14. Explore employability and social skills relative to careers involving invention and innovation.

Connections

- Kentucky Technology Student Association (KYTSA)
- Kentucky Academic Standards
- Standards for Technological Literacy

Technological Systems
Valid Course Code: 210103

Course Description: This course is intended to teach students how technological systems work together to solve problems and capture opportunities. A system can be as small as two components working together (technical system/device level) or can contain millions of interacting devices (use system/network level). We often break down the macro-systems into less complicated micro-systems in order to understand the entire system better. However, technology is becoming more integrated, and systems are becoming more and more dependent upon each other than ever before. Electronic systems are interacting with natural (i.e., biological) systems as humans use more and more monitoring devices for medical reasons. Electrical systems are interacting with mechanical and fluid-power systems as manufacturing establishments become more and more automated. This course will give students general background on the different types of systems but will concentrate more on the connections between these systems. The goals of this course can be accomplished in a laboratory environment through a variety of instructional strategies. **Participation in Kentucky Technology Student Association will greatly enhance instruction.**

Content/Process

Students will:

1. Demonstrate the use of an engineering design process to solve real-world problems.
2. Define technological systems.
3. Explore technological concepts and processes in the contexts of energy and power, information and communication, transportation, manufacturing, construction, medical, agricultural and bio-related technologies in emerging technological systems/sub-systems.
4. Design, test, evaluate, and modify models within technological systems.
5. Solve basic technological problems using tools, machines, materials, and processes in an applied project-based approach.
6. Analyze current and emerging issues (e.g. ethical, social, legal, environmental, political, and privacy) related to a wide variety of technological systems.
7. Develop and demonstrate strategies and work habits that will lead to success and prepare the student for a future career in a technological world.
8. Demonstrate and apply an understanding of technological systems and the relationships between the resources/input, processes, output, and feedback elements of these systems.
9. Analyze the changing nature and impacts of a variety of technological systems.
10. Identify current and emerging occupations related to a variety of technological systems.
11. Identify, analyze, and compare current and emerging jobs, careers, and occupations relating to a variety of technological systems.

Connections

- Kentucky Technology Student Association (KYTSA)
- Kentucky Academic Standards
- Standards for Technological Literacy