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Science, Technology, Engineering and Mathematics Cluster

Cluster Description:

The Science, Technology, Engineering and Mathematics Cluster focuses on careers in planning, managing, and providing scientific research and professional and technical services (e.g., physical science, social science, engineering) including laboratory and testing services, and research and development services.

Engineering and Technology Pathway

Pathway Description:

For a future in the Engineering and Technology pathway, students should study and apply principles from advanced mathematics life sciences physical science, earth and space science, and technology. In addition, future engineers and technologists should learn certain processes in mathematics, science and technology. In Grades 9-12, all future engineers and technologists should study mathematics each year, learning important mathematical concepts and processes defined by the National Council of Teachers of Mathematics in Principles and Standards for School Mathematics. With such knowledge and skills, students will be able to demonstrate the following competencies: 1.) Apply mathematics, science and technology concepts to solve problems quantitatively in engineering projects involving design, development or production in various technologies; and 2.) Recognize the core concepts of technology and their relationships with engineering, science and math, and other subjects. All future engineers and technologists should learn important science concepts and processes with an understanding of physics, chemistry and biology as a minimal set. These concepts and processes are defined by the National Research Council in the National Science Education Standards and by the American Association for the Advancement of Science in Benchmarks for Science Literacy. Additionally, learners should become proficient in the areas of technology defined by the Standards for Technological Literacy.

Program of Study: ST2460 Pre-Engineering (Project Lead The Way)

Courses: 2461 Introduction to Engineering Design
2463 Principles of Engineering*
Two Pre-Engineering Specializations

Program of Study Description:

The Pre-Engineering Program of Study focuses a broad range of engineering careers and foundation knowledge including basic safety, plan reading, use of tools and equipment as well as how to employ positive work ethics in an engineering career.

Course Descriptions:

2461 Introduction to Engineering Design

Introduction to Engineering Design is a component of the Project Lead the Way (PLTW) pre-engineering curriculum. This course teaches problem-solving skills using a design development

process. Models of product solutions are created, analyzed, and communicated using solid modeling computer design software. Students utilize problem-solving techniques and participate in hands-on activities to develop an understanding of course concepts. Teachers should provide each student with real world learning opportunities and instruction. Students are encouraged to become active members of the student organizations, WV SkillsUSA. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools, and skill sets.

2463 Principles of Engineering*

Principles of Engineering is a component of the Project Lead the Way (PLTW) pre-engineering curriculum. This course will help students understand the field of engineering and engineering technology. Exploring various technology systems and manufacturing processes help students learn how engineers and technicians use math, science, and technology in an engineering problem solving process to benefit people. The course also includes concerns about social and political consequences of technological change. Students utilize problem-solving techniques and participate in hands-on activities to develop an understanding of course concepts. Teachers should provide each student with real world learning opportunities and instruction. Students are encouraged to become active members of the student organizations, WV SkillsUSA or WV TSA (Technology Student Association). All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools, and skill sets.

*This course will fulfill the requirement for a third science course graduation requirement.

Pre-Engineering Specializations: Choose Two

2464 Engineering Design and Development

Engineering Design and Development is a component of the Project Lead the Way (PLTW) pre-engineering curriculum. This is an engineering research course in which students work in teams to research, design, and construct a solution to an open-ended engineering problem. Students apply principles developed in the four preceding courses and are guided by a community mentor. They must present progress reports, submit a final written report, and defend their solutions to a panel of outside reviewers at the end of the school year. Safety instruction is integrated into all activities. Students utilize problem-solving techniques and participate in hands-on activities to develop an understanding of course concepts. Teachers should provide each student with real world learning opportunities and instruction. Students are encouraged to become active members of the student organizations, WV SkillsUSA or WV TSA (Technology Student Association). All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools, and skill sets.

2462 Digital Electronics

Digital Electronics is a component of the Project Lead the Way (PLTW) pre-engineering curriculum. This is a course in applied logic that encompasses the application of electronic

circuits and devices. Computer simulation software is used to design and test digital circuitry prior to the actual construction of circuits and devices. Students utilize problem-solving techniques and participate in hands-on activities to develop an understanding of course concepts. Teachers should provide each student with real world learning opportunities and instruction. Students are encouraged to become active members of the student organizations, WV SkillsUSA or WV TSA (Technology Student Association). All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools, and skill sets.

2465 Computer Integrated Manufacturing Project Lead the Way

Computer Integrated Manufacturing is a component of the Project Lead the Way (PLTW) pre-engineering curriculum. This course will introduce students to principles of robotics and automation and CAD design. The course builds on computer solid modeling skills developed in Computer Integrated Manufacturing, and Design and Drawing for Production. Students use CNC equipment to produce actual models of their three-dimensional designs. Fundamental concepts of robotics used in automated manufacturing and design analysis are included. Students utilize problem-solving techniques and participate in hands-on activities to develop an understanding of course concepts. Teachers should provide each student with real world learning opportunities and instruction. Students are encouraged to become active members of the student organizations, WV SkillsUSA or WV TSA (Technology Student Association). All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools, and skill sets.

2466 Civil Engineering and Architecture

Civil Engineering and Architecture is a component of the Project Lead the Way (PLTW) pre-engineering curriculum. This course provides an overview of the fields of Civil Engineering and Architecture, while emphasizing the interrelationship and dependence of both fields on each other. Students use state of the art software to solve real world problems and communicate solutions to hands-on projects and activities. This course covers topics such as: roles of civil engineers and architects, project planning, site planning, building design, and project documentation and presentation. Students utilize problem-solving techniques and participate in hands-on activities to develop an understanding of course concepts. Teachers should provide each student with real world learning opportunities and instruction. Students are encouraged to become active members of the student organizations, WV SkillsUSA or WV TSA (Technology Student Association). All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools, and skill sets.

2468 Aerospace Engineering

Aerospace Engineering is a component of the Project Lead the Way (PLTW) pre-engineering curriculum. The major focus of this course is to expose students to the world of aeronautics, flight, and engineering. Students will be introduced to activity-based, project-based, and problem-based learning through exploring the world of Aerospace Engineering. Students should have experience in physics, mathematics, and technology education. They will employ

engineering and scientific concepts in the solution of aerospace problems. The entire curriculum sequence will include experiences from the diverse fields of Aeronautics, Aerospace Engineering and related areas of study. Lessons will engage students in engineering design problems related to aerospace information systems, astronautics, rocketry, propulsion, the physics of space science, space life sciences, the biology of space science, principles of aeronautics, structures and materials, and systems engineering. Students utilize problem-solving techniques and participate in hands-on activities to develop an understanding of course concepts. Teachers should provide each student with real world learning opportunities and instruction. Students are encouraged to become active members of the student organizations, WV SkillsUSA or WV TSA (Technology Student Association). All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools, and skill sets.

2469 Environmental Sustainability

In ES, students investigate and design solutions in response to real-world challenges related to clean and abundant drinking water, food supply issues, and renewable energy. Applying their knowledge through hands-on activities and simulations, students research and design potential solutions to these true-to-life challenges.

Program of Study: ST2175 Energy, Power and Engineered Systems (Advanced Careers)

Courses: 2485 AC Energy, Power, and Engineered Systems I*
2486 AC Energy, Power, and Engineered Systems II*
2487 AC Energy, Power, and Engineered Systems III*
2488 AC Energy, Power, and Engineered Systems IV*

Program of Study Description:

The Energy, Power and Engineered Systems Program of Study prepares students for college and career readiness in the technical fields of energy, electronics, and engineering systems. Courses focus on blending STEM and CTE.

Course Descriptions:

2485 AC Energy, Power, and Engineered Systems I

Energy and Power Foundations is a foundational course on the origins and production of renewable and nonrenewable energy sources with an overview of energy and power career fields and cutting edge job opportunities. This course provides students with opportunities to directly test and evaluate theories and practices of energy systems.

2486 AC Energy, Power, and Engineered Systems II

Energy Transmission and Distribution is a foundational course that begins after initial energy generation. The course continues from energy transmission to consumer usage and includes the introduction to AC/DC power, transformers, the electrical grid and Smart Grid, and consumer load on the system.

2487 AC Energy, Power, and Engineered Systems III

Electronics and Control Systems is the advanced Energy, Power & Engineered Systems course designed to provide training and skills necessary to understand energy control systems in the fields of transformers, switches (electrical, pneumatic, hydraulic and mechanical), breakers, panel boards, switchboards, and programmable logic controllers in both residential and industrial settings.

2488 AC Energy, Power, and Engineered Systems IV

Advanced Science and Engineered Systems is the advanced course designed for students to become building technicians, design engineers, recreational engineers, electrical technicians, and CEOs, while learning about real-world energy and power issues. Students will need to have a basic understanding of electricity (both a/c and d/c) and higher level mathematics. This course incorporates knowledge of multiple sources of energy, engineered systems, societal impact and “the business of energy.”

*Students must pass all four courses of the Energy, Power and Engineered Systems Advanced Career Program of Study to fulfill the third science course graduation requirement.

Program of Study: ST2200 Aerospace Engineering (Advanced Careers)

Courses: 1540 AC Aerospace Engineering I
1541 AC Aerospace Engineering II
1542 AC Aerospace Engineering III
1543 AC Aerospace Engineering IV

Program of Study Description:

The Aerospace Engineering program of study is designed to prepare students for careers and further study in aerospace technologies and related industries. The program's four-course sequence will provide students with the opportunity to apply concepts and principles of atmospheric flight and space flight to authentic situations with an emphasis on propulsion systems, ballistic projectiles, airplane wing design, aerodynamic forces, pneumatic projectiles, and quality management and enhance their knowledge of space through a series of projects that include in-depth research, concept application and prototype development.

The Aerospace Engineering program will also develop technological literacy and stimulate interest in pursuing a career in aerospace engineering or related fields. While the program does not specifically provide projects in aviation mechanics, the knowledge and skills students learn and apply will enhance their success in postsecondary aviation studies. Students will learn to work in teams, think critically, identify problems, propose solutions, read and comprehend complex technical materials, and communicate understanding effectively in written, oral and electronic formats. They will apply math and science concepts and use technology to effectively solve real-world, challenging problems. Through project-based learning, students explore aerospace technologies and learn to apply those habits of behavior unique to the field.

Course Descriptions:

1540 AC Aerospace Engineering I

A one-credit course designed to prepare students for careers and further study in aerospace technologies and related industries. Students apply fundamental concepts and principles of atmospheric flight to authentic situations. Emphasis is placed on propulsion systems, ballistic projectiles, and airplane wing design.

1541 AC Aerospace Engineering II

A one-credit course designed to deepen students' preparation for careers and further study in aerospace technologies and related industries. Students apply advanced principles and theories of flight to authentic projects related to atmospheric and space flight. Emphasis is placed on pneumatic projectiles, aerodynamic forces, and quality management. The prerequisite for this course is Fundamentals of Aerospace Technology.

1542 AC Aerospace Engineering III

A one-credit course that allows students to further enhance their knowledge of space through a series of projects that include in-depth research, concept application, and prototype development. Students will develop a capstone project, complete a prototype and defend its

development before a selected audience. The prerequisites for this course are Fundamentals of Aerospace Technology and Advanced Aerospace Technology.

1543 AC Aerospace Engineering IV

A one-credit course designed to enhance students' knowledge of flight. Students will be engaged in projects that require extensive research, concept application, and prototype development. The capstone project will be presented and defended before a select panel of reviewers. The prerequisites for this course are Fundamentals of Aerospace Technology and Advanced Aerospace Technology.

Program of Study: ST2205 Innovations in Science and Technology (Advanced Careers)

- Courses:** 1545 AC Innovations in Science and Technology I
1546 AC Innovations in Science and Technology II
1547 AC Innovations in Science and Technology III
1548 AC Innovations in Science and Technology IV

Program of Study Description:

The Innovations in Science and Technology program will develop students' technological literacy and stimulate their interest in pursuing a career in science, technology, engineering and mathematics (STEM). This STEM program will provide students with the knowledge and hands-on experiences they need to be successful in the new global workforce. The ideal candidate for this curriculum has an enthusiastic curiosity and enjoys challenges that involve solving complex real-world problems. Through the four courses that make up this curriculum, students will learn to work in teams, think critically, identify problems, and design and test solutions. Students will learn to read and comprehend complex technical materials and communicate effectively their understanding of these materials in written, oral and electronic formats. Further, they will learn to apply math and science understandings, and use technology to effectively solve challenging problems. Through project based assignments, students will explore the future of science and technology, and learn to apply the habits of mind and behavior unique to professionals in the field. They will learn how to program and use National Instruments' (NI) LabVIEW software and the my DAQ data acquisition device to work as engineers in making and analyzing scientific measurements. The two foundational courses will engage students in hands-on assignments that challenge them to design, build and evaluate solutions to problems and projects such as The Science of Survival, Cleaning Up Our Water Supply, and Designing and Building an Earthquake-Proof Shelter. Each course will require students to employ the engineering design process. They will do research, follow a line of reasoning, organize and present information, and prepare a written report developed in a style appropriate for the task, purpose and audience. Students will follow a multi-step procedure when carrying out experiments; take measurements; use geometric shapes, measures, and properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder); and draw on their creativity and imagination, and from their knowledge base when tackling problems. Students completing the program may become an NI Certified LabVIEW Associate Developer (CLAD) and may be prepared for earning other relevant industry certifications.

Course Descriptions:

1545 AC Innovations in Science and Technology I

This is a contextual-based course that introduces students to the core fundamental concepts of science and technology through authentic projects. Through these projects, students will develop an understanding of the relationship between the physical, biological and social world. Students will gain an understanding of the differences between science and technology, and learn that technology is a process for applying science. Students will develop a deeper understanding of scientific inquiry and the engineering design process when solving real-world

problems. Students will experience the interaction of science, technology, engineering, math and literacy through a problem-based learning environment. Finally, the process will require students to use mathematics to analyze costs, develop budgets and make precise measurements to successfully implement project goals.

1546 AC Innovations in Science and Technology II

This course uses the concepts learned from Course 1 to further develop students' problem-solving strategies and skills needed by the 21st-century workforce. Students will continue to explore emerging technologies and techniques in the context of addressing authentic projects. Key concepts introduced in this course include sustainability and environmental trends, systems thinking, and trend analysis and prediction. Through engagement, students will experience the necessary connection between literacy, mathematics and science in a variety of hands-on, real-world projects requiring them to apply academic and technical concepts and skills and technology to complete.

1547 AC Innovations in Science and Technology III

This course will examine the past, present and future impact of science and technology on culture, society and the environment. Students will explore how their predecessors worked to solve some problems that still exist today, and examine the potential of using modern technology to solve those problems. From these explorations, students will engage in a variety of hands-on design projects that will address tradeoffs, optimization, interconnectivity and the nature of complex systems.

1548 AC Innovations in Science and Technology IV

This course will allow students to brainstorm, use invention, innovation, creativity, predictive analysis and use technology to solve real-world problems. Dimensions covered will include research and development, troubleshooting, experimentation, design failures, patents and trademarks, and design under constraints.

Program of Study: ST2225 Clean Energy (Advanced Careers)

Courses: 1565 AC Clean Energy I
1566 AC Clean Energy II
1567 AC Clean Energy III
1568 AC Clean Energy IV

Program of Study Description:

The Clean Energy Technology program enables students to apply fundamental science and operating principles of clean energy systems to authentic problems. Such problems involve motors and generators, photovoltaic systems, water and energy conservation, wind turbines, biofuel generation, bioreactors, water power, energy harvesting, fuel cells and nuclear power. Students use an engineering design process to develop solutions to these authentic problems. Students master industry-standard simulation and modeling software sourced from the U.S. Department of Energy and related national laboratories as well as National Instruments (NI). Students use Web-based applications, especially those with embedded graphical information systems (GIS) content, to relate geography, climate and terrain with the availability and economics of wind and solar resources. Students discover how the perceptions of consumers, manufacturers, technologists and regulators shape and affect the rate and scale of clean energy technology adoption. Students analyze prices in energy markets and how prices communicate the opportunity costs of clean energy systems. Students completing the program may become an NI Certified LabVIEW Associate Developer (CLAD) and may be prepared for earning other relevant industry certifications.

Course Descriptions:

1565 AC Clean Energy I

This course exposes students to three sources of renewable energy: wind, solar and biofuels. Working with solar, thermal, chemical and mechanical sources of clean energy teaches students how to apply physics, geography, chemistry, biology, geometry, algebra and engineering fundamentals. Students learn the most efficient and appropriate use of energy production as they explore the relevant relationships among work, power and energy. Students will engage in a wide variety of hands-on projects and lab activities that both test their knowledge and illustrate the interrelationships between the various forms of clean energy.

1566 AC Clean Energy II

This course builds on the foundation of Course 1 and introduces nuclear power, steam generation, fuel cells, geothermal power, water power, AC/DC power generation, heat transfer and the laws of thermodynamics. In addition, students now use chemical and thermal energy principles to create, store and use energy efficiently to power a variety of mechanical and electrical devices. Students will engage in a variety of hands-on design projects to demonstrate principles using advanced technology hardware and software.

1567 AC Clean Energy III

Students in this course utilize applicable skills from the foundational courses to tackle challenges associated with the implementation of clean energy technology. The hands-on projects encountered during this course will require students to address specific issues related to providing portable power in any situation, developing new energy storage systems, increasing the efficiency of the modern home, and designing more energy efficient buildings and homes.

1568 AC Clean Energy IV

The innovations course is the fourth and final course in the Clean Energy Technology Pathway Program. The course will provide students the opportunity to work independently with open-ended, problem-solving scenarios to create an original solution in the area of clean energy entrepreneurship or clean energy research and development. Students will collaborate with a mentor to conduct applied research around a defined research problem, develop solutions, collect and analyze relevant data, evaluate their solutions, and present their findings in public venues and competitions.

Science, Technology, Engineering and Mathematics Cluster Electives

Engineering and Technology Pathway Electives

Program of Study: ST2460 Pre-Engineering – Project Lead the Way

WVEIS CODE	Courses
0520	Work-Based Integration and Transition
2436	Foundations in Engineering

Electives Course Descriptions:

0520 Work-Based Integration and Transition

This course gives students the opportunity to integrate theory and practice by interacting with industry professionals. Students will study various requirements for employability including ethics, communication, teamwork and professionalism. Students will participate in hands-on, digital or work-based experiences related to industry settings in order to practice skill sets and to transition from student to employee. A supervised project will be developed in one or more of the following categories: Entrepreneurship (ownership or operation of a business); Placement (employment or internship); Research and Experimentation (planning and/or conducting a scientific experiment); Exploration (exploration of related careers through activities such as shadowing employees in various work settings, conducting on-line research, attending professional development activities, etc.). Students will develop materials to supplement their Simulated Workplace portfolios.

2436 Foundations in Engineering

This course provides opportunities for students to study and apply basic principles of materials, mechanisms, structures, electricity, electronic control, fluidics, computer control, and graphic communication and how they can be integrated and used to solve a variety of complex technical challenges. Students work in engineering teams to develop work process skills, such as researching, writing, organizing, modeling, calculating, analyzing and communicating with others. Students will utilize problem-solving techniques and manipulative skills while completing laboratory activities to develop an understanding of course concepts. Safety instruction is integrated into all activities.

Program of Study: ST2175 Energy, Power and Engineered Systems (Advanced Careers)

WVEIS CODE	Courses
0520	Work-Based Integration and Transition

Electives Course Description:

0520 Work-Based Integration and Transition

This course gives students the opportunity to integrate theory and practice by interacting with industry professionals. Students will study various requirements for employability including ethics, communication, teamwork and professionalism. Students will participate in hands-on, digital or work-based experiences related to industry settings in order to practice skill sets and to transition from student to employee. A supervised project will be developed in one or more of the following categories: Entrepreneurship (ownership or operation of a business); Placement (employment or internship); Research and Experimentation (planning and/or conducting a scientific experiment); Exploration (exploration of related careers through activities such as shadowing employees in various work settings, conducting on-line research, attending professional development activities, etc.). Students will develop materials to supplement their Simulated Workplace portfolios.

Program of Study: ST2200 Aerospace Engineering (Advanced Careers)

WVEIS CODE	Courses
0520	Work-Based Integration and Transition

Electives Course Description:

0520 Work-Based Integration and Transition

This course gives students the opportunity to integrate theory and practice by interacting with industry professionals. Students will study various requirements for employability including ethics, communication, teamwork and professionalism. Students will participate in hands-on, digital or work-based experiences related to industry settings in order to practice skill sets and to transition from student to employee. A supervised project will be developed in one or more of the following categories: Entrepreneurship (ownership or operation of a business); Placement (employment or internship); Research and Experimentation (planning and/or conducting a scientific experiment); Exploration (exploration of related careers through activities such as shadowing employees in various work settings, conducting on-line research, attending professional development activities, etc.). Students will develop materials to supplement their Simulated Workplace portfolios.

Program of Study: ST2205 Innovations in Science and Technology (Advanced Careers)

WVEIS CODE	Courses
0520	Work-Based Integration and Transition

Electives Course Description:

0520 Work-Based Integration and Transition

This course gives students the opportunity to integrate theory and practice by interacting with industry professionals. Students will study various requirements for employability including ethics, communication, teamwork and professionalism. Students will participate in hands-on, digital or work-based experiences related to industry settings in order to practice skill sets and to transition from student to employee. A supervised project will be developed in one or more of the following categories: Entrepreneurship (ownership or operation of a business); Placement (employment or internship); Research and Experimentation (planning and/or conducting a scientific experiment); Exploration (exploration of related careers through activities such as shadowing employees in various work settings, conducting on-line research, attending professional development activities, etc.). Students will develop materials to supplement their Simulated Workplace portfolios.

Program of Study: ST2225 Clean Energy (Advanced Careers)

WVEIS CODE	Courses
0520	Work-Based Integration and Transition

Electives Course Description:

0520 Work-Based Integration and Transition

This course gives students the opportunity to integrate theory and practice by interacting with industry professionals. Students will study various requirements for employability including ethics, communication, teamwork and professionalism. Students will participate in hands-on, digital or work-based experiences related to industry settings in order to practice skill sets and to transition from student to employee. A supervised project will be developed in one or more of the following categories: Entrepreneurship (ownership or operation of a business); Placement (employment or internship); Research and Experimentation (planning and/or conducting a scientific experiment); Exploration (exploration of related careers through activities such as shadowing employees in various work settings, conducting on-line research, attending professional development activities, etc.). Students will develop materials to supplement their Simulated Workplace portfolios.

Foundational/Non-Occupational Courses

Course Description:

2421 Communications Systems

This course provides opportunities for students to study and apply technological systems, concepts and processes in communications technology. Group and individual activities engage students in creating ideas, developing innovations and implementing design solutions as they relate to communication systems. Students will utilize problem-solving techniques and manipulative skills while completing laboratory activities to develop an understanding of course concepts. Safety instruction is integrated into all activities.

2424 Construction Systems

This course provides opportunities for students to study and apply technological systems, concepts and processes as they relate to construction technology. Group and individual activities engage students in creating ideas, developing innovations and implementing design solutions as they relate to construction systems. Students will utilize problem-solving techniques and manipulative skills while completing laboratory activities to develop an understanding of course concepts. Topics range from how construction meets the needs of society to basic construction techniques. Safety instruction is integrated into all activities.

2436 Foundations in Engineering

This course provides opportunities for students to study and apply basic principles of materials, mechanisms, structures, electricity, electronic control, fluidics, computer control, and graphic communication and how they can be integrated and used to solve a variety of complex technical challenges. Students work in engineering teams to develop work process skills, such as researching, writing, organizing, modeling, calculating, analyzing and communicating with others. Students will utilize problem-solving techniques and manipulative skills while completing laboratory activities to develop an understanding of course concepts. Safety instruction is integrated into all activities.

2442 Manufacturing Systems

This course will introduce students to the basic elements of the manufacturing industry. This course provides opportunities for students to study and apply technological systems, concepts and processes in the development and operation of a student manufacturing enterprise. Group and individual activities engage students in creating ideas, developing innovations and implementing design solutions as they relate to manufacturing systems. Students will utilize problem-solving techniques and manipulative skills while completing laboratory activities to develop an understanding of course concepts. Safety instruction is integrated into all activities.

2445 Mechanical Services Systems

This course will introduce students to the basic principles of mechanisms, electricity/electronics and fluidics involved in the support, maintenance, design and installation of all types of mechanical and electrical devices. Students will explore a variety of techniques used in the

mechanical services industry, and apply this knowledge in a variety of hands-on activities. Safety instruction is integrated into all activities.

2448 Transportation Systems

This course provides opportunities for students to study and apply technological systems, concepts and processes as they relate to relocating people and goods. Group and individual activities engage students in creating ideas, developing innovations and implementing design solutions as they relate to transportation systems. Students will utilize problem-solving techniques and manipulative skills while completing laboratory activities to develop an understanding of course concepts. Topics range from the transportation subsystems to the sources of energy used in the industry. Safety instruction is integrated into all activities.

2451 Fundamentals of Millwork and Cabinetmaking

This exploratory course introduces students to the knowledge fundamentals of millwork and cabinetmaking. Students will explore career opportunities, safety, measurement, blue prints, drawings, plans, hand and power tools, wood properties, cabinet layout, assembly, and finishing. Emphasis will be placed on career exploration, job seeking skills, and personal and professional ethics. Safety instruction is integrated into all activities. Students will utilize problem-solving techniques and participate in laboratory activities to develop an understanding of course concepts, and teachers should provide each student with real world learning opportunities and instruction related to millwork and cabinetmaking occupations.

Middle School Career Technical Education Courses

Course Descriptions:

1893 Gateway: Automation and Robotics

Students trace the history, development, and influence of automation and robotics. They learn about mechanical systems, energy transfer, machine automation and computer control systems. Students use a robust robotics platform to design, build and program a solution to solve an existing problem.

1918 Gateway: Computer Science 1

Studies show that by 2018, 1.4 million job openings will be available for computer specialists. 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.

1920 Gateway: Computer Science 2

Students continue to explore the fundamentals of the stimulating career path of computer science. They venture into text programming through Python and, in the final problem, develop an app to crowdsource and analyze data on a topic of their interest.

1894 Gateway: Design and Modeling

In this unit, students begin to recognize the value of an engineering notebook to document and capture their ideas. They are introduced to and use the design process to solve problems and understand the influence that creative and innovative design has on our lives. Students use industry standard 3D modeling software to create a virtual image of their designs and produce a portfolio to showcase their creative solutions.

1895 Gateway: Energy and the Environment

Students investigate the impact of energy on our lives and the environment. They design and model alternative energy sources and participate in an energy expo to demonstrate energy concepts and innovative ideas. Students evaluate ways to reduce energy consumption through energy efficiency and sustainability.

1896 Gateway: Flight and Space

The rich history of aerospace comes alive through hands-on activities, research, and a presentation in the form of a short informational video. Students explore the science behind aeronautics and use their knowledge to design, build and test an airfoil. Custom-built simulation software allows students to experience space travel.

1897 Gateway: Green Architecture

In a world of reduced resources and environmental challenges, it is important to present the concept of “being green” to the next generation of designers and builders. In this unit, students are introduced to architectural plans, construction styles, alternative materials and processes,

dimensioning, measuring and architectural sustainability. Students use a 3D architectural software program to create an environmentally friendly home using shipping containers.

1898 Gateway: Magic of Electrons

Through hands-on projects, students explore the science of electricity, behavior and parts of atoms, and sensing devices. Students acquire knowledge and skills in basic circuitry design and examine the impact of electricity on our lives.

1899 Gateway: Science of Technology

How has science affected technology throughout history? To answer this question students apply the concepts in physics, chemistry and nanotechnology to STEM activities and projects.

1900 Gateway: Medical Detectives

Medical Detectives (MD) explores the biomedical sciences through hands-on projects and labs that require students to solve a variety of medical mysteries. Students investigate medical careers, vital signs, diagnosis and treatment of diseases, as well as human body systems such as the nervous system. Genetic testing for hereditary diseases and DNA crime scene analysis put the students in the place of real life medical detectives.

2405-2409 Exploring Technology Education

Exploring Technology Education is a hands-on approach for students to explore the systems of information and communication; transportation; construction; manufacturing; agriculture and related biotechnologies; medical; and energy and power through STEM related activities/projects. Careers associated with these industries are identified during this process.