



**School
District of the
City of St.
Charles**

Industrial Technology/ Technology and Engineering

Approved by the Board of Education
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**Industrial Technology/
Technology and Engineering
Curriculum Committee**

Assistant Superintendent of Curriculum & Instruction

Dr. Earl Draper

Curriculum Committee Chairperson

Dr. Tina Lauer

Curriculum Developers

Patrick Beckham

Kevin Dill

Jeremy Jackson

Erik Jameson

Jennifer Mueller

Dr. Michael Zacheis

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District Mission

Engage. Empower. Inspire.
Every Learner, Every Day!

District Vision

The City of St. Charles School District will be a leader of academic excellence that prepares students to be successful in all aspects of life.

District Values

We, the City of St. Charles School District community of students, parents, staff, and patrons, value:

- Academic Excellence
 - We use research-based best practices to help all students reach their highest potential
 - We engage students through active learning and collaboration to foster lifelong achievement
 - We set measurable goals, personalize instruction, and celebrate every student's growth.
- Student Centered
 - We inspire learners to embrace continuous growth and improvement.
 - We develop the whole child academically, socially, emotionally, and behaviorally.
 - We equip students with the skills and knowledge for success in SCSD and beyond.
- Integrity
 - We align our actions to our values.
 - We are transparent and honest in our communication.
 - We hold ourselves accountable for doing the right thing.
- Diversity
 - We respect, honor, and celebrate every member of our community within & beyond the classroom.
 - We acknowledge and value the unique qualities in everyone's learning journey.
 - We embrace our diversity as a source of strength and unity.
- Community
 - We collaborate across all community levels to build an inclusive and supportive environment that empowers every student.
 - We cultivate opportunities for our students to connect and contribute within the district and beyond.
 - We foster open communication through diverse channels to engage all stakeholders.

District Goals

1. Academic Performance
 - Attendance
 - Student Achievement
 - Success Ready Students
2. Culture
 - Student Support
 - Sense of Belonging
 - Community Involvement
3. Facilities, Support, and Instructional Resource
 - School Configuration
 - Facilities
 - Staffing
 - Finance

Industrial Technology/Technology and Engineering Philosophy and Rationale

The philosophy of high school industrial technology education is centered on equipping students with practical, hands-on skills and intellectual curiosity that mirror the evolving demands of modern industries. This educational approach aims to foster a deep understanding of the real-world applications of core academic subjects like mathematics, science, and engineering. By integrating these subjects into industrial contexts, students are not only encouraged to explore the mechanics of industrial processes but also to develop critical thinking, creativity, and problem-solving abilities. The focus on sequential and developmental learning ensures that students are continually building upon their knowledge, while the program's emphasis on creativity and innovation reflects the dynamic nature of today's technological world.

In an era marked by rapid technological advancements and ever-evolving industries, high school industrial technology education serves as an essential bridge between traditional academic learning and practical career readiness. The rationale behind this program is to provide students with the tools they need to thrive in an increasingly technical and industrialized workforce. By exposing students to the latest technologies and teaching approaches, they gain both the technical competence and adaptive mindset required for success in modern industry. Moreover, the program enhances student engagement by offering hands-on learning experiences that are directly applicable to real-world scenarios, boosting their self-esteem and eagerness to learn. This approach not only prepares students for potential careers in industrial fields but also equips them with transferable skills applicable to a wide range of professions.

Industrial Technology/Technology and Engineering Program Goals

- Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems.
- Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields.
- Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.

Industrial Technology/Technology and Engineering Course Descriptions

- **Woodworking and Material Processes** - Students can learn the basic procedures for using common hand tools, portable power tools, and industrial-grade material processing tools. Each student is required to wear safety glasses in the lab. Problem-solving and decision-making are key components of this class. The first semester is reserved for learning safety procedures, materials, and hand and power equipment through bookwork, lectures, and producing instructor-designed projects. Students are required to pay for the materials to complete each project
- **Advanced Woodworking and Material Processes** - This is an advanced lab class in which the student chooses from a variety of projects on an individual basis. These include, but are not limited to woodworking, school improvement projects, maintenance, landscaping, and building. There are no specific required projects. Students are to design and construct a project (s) of their own choosing. The total cost for the course will depend upon the amount of materials used. Students are required to pay for the materials to complete each project (unless it is a school improvement project).
- **Robotics** - This course is an intro to robotics. We will be utilizing various robotics kits and materials. The objective is to introduce the student to basic programming as well as problem-solving strategies. This course will involve students in the development, building, and programming of a robot. Students will work hands-on in teams to design, build, program, and document their progress. Topics may include motor control, gear ratios, torque, friction, sensors, program loops, decision-making, and timing sequences.
- **Advanced Robotics** - Students will dive deeper into the field of robotics using various and more advanced robotic platforms. Students will work hands-on in teams to design, build, program, and document their progress. Students will use the robots they design, build and program to compete in class competitions.
- **Intro to Digital Tech** - Intro to Digital Tech is an introduction to many different technologies. Fun, interactive learning tools help promote science, technology, engineering, and math. This class offers design, visualization, and simulation capabilities so students can easily transition between 2D and 3D design environments, and fully experience their creative ideas digitally. The possibilities of software applications the students will be introduced to include engineering, architecture, video editing, and special effects. For further explanation see the Industrial Technology instructor. The lab fee covers materials for projects done in class.
- **Home Repairs** - Home Repairs provides the basic information needed to understand and use hand tools, power tools, fasteners, and assorted building materials for the repair and maintenance of your future home. You will gain knowledge of the structure of a home and the skills and techniques used in carpentry, plumbing, electricity, and other building and landscaping trades. Proper maintenance of all housing systems will be stressed to prevent costly repairs and aesthetically pleasing homes. The lab fee covers a variety of materials for projects done in class.
- **Live Video Production Technology** - This exciting class allows students to work in a live production environment similar to that of Cardinals or Blues television production. Students use teamwork and problem-solving skills to set up and run live game productions. Students will plan, film, and edit team intro videos, player profiles, and other video board content. They also get to display their own creative content on the video board during games and assemblies.
- **Short Film Video Production Technology** - This exciting class allows students to be creative with video projects ranging from commercials to music videos to film festival-quality short films.

Students are in charge of projects from concept to completion. They develop storylines, characters, and scripts as well as plan shots, and film, and edit video, audio, and effects.

- **School Improvement Team** - In this hands-on class, students will apply the skills acquired in the Home Repairs and Woodworking courses to undertake a variety of meaningful projects throughout the school. These projects will not only contribute to enhancing the school environment but also empower students to take ownership of their creations. Through collaboration with peers and meetings with school principals and various groups, students will engage in planning, designing, and executing projects that address real needs within the school. This experience will provide valuable opportunities to develop essential skills in problem-solving, communication, and project management, preparing students for future challenges in both academic and professional settings. Join us to make a tangible impact on your school community while gaining practical experience that extends beyond the classroom!
- **PLTW Introduction to Engineering** - Students will dig deep into the engineering design process, applying math, science, and engineering standards to hands-on projects like designing a new toy or improving on an existing product. They will work both individually and in teams to design solutions to a variety of problems using 3-D modeling software and use an engineering notebook to document their work. This is the introductory Project Lead the Way (PLTW) course in the Engineering pathway.
- **PLTW Civil Engineering and Architecture** - Students learn important aspects of building and site design and development. They apply math, science, and standard engineering practices to design both residential and commercial projects and document their work using 3-D architectural design software.
- **PLTW Principles of Engineering** - Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of materials and structures, automation, and motion. Students develop skills in problem-solving, research, and design while learning strategies for design process documentation, collaboration, and presentation. Then, they apply what they know to take on challenges including building bridges, compound machine design and robots designed to perform specific tasks.
- **PLTW Capstone** - PLTW Capstone is a capstone course for students who are completing any of PLTW's high school programs. It is an open-ended research course in which students work in teams to design and develop an original solution to a well-defined and justified open-ended problem. Teams draw on the knowledge, skills, and interests of each member, as they perform research to select, define, and justify a problem. Given this collaboration, team members leave the course with a broadened skillset and an appreciation for learning from their peers. After carefully defining the design requirements and creating multiple solution approaches, student teams select an approach, create, and test or model their solution prototype. As they progress through the problem-solving process, students work closely with experts and continually hone their organizational, communication, and interpersonal skills, creative and problem-solving abilities, and their understanding of the integration of processes such as the design process, experimental design, and the software development process. At the conclusion of the course, teams present and defend their original solution to an outside panel. PLTW Capstone is appropriate for upper grade-level students who are interested in any technical career path because the projects students work on can vary with student interest, and the curriculum focuses on collaborative problem solving and project management. Students should take PLTW Capstone as the final PLTW course, because it requires application of the knowledge and skills introduced during the PLTW foundation courses. This course is not designed to teach additional content, but to empower students to find resources—mentors, subject matter experts, research articles, peers, and teachers—to meet their needs, bolster their skills, and solve the problem they have selected.

Woodworking and Material Processes

Course Overview

Grade level(s): 9-12	Credits earned: 1 credit (full year course)
Course Description	
Students can learn the basic procedures for using common hand tools, portable power tools, and industrial-grade material processing tools. Each student is required to wear safety glasses in the lab. Problem-solving and decision-making are key components of this class. The first semester is reserved for learning safety procedures, materials, and hand and power equipment through bookwork, lectures, and producing instructor-designed projects. Students are required to pay for the materials to complete each project.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses National standards for Industrial Technology) • Standard 2: Core Concepts of Technology and Engineering ○ 2W - Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste, while solving problems. • Standard 7: Design in Technology and Engineering Education ○ 7W - Determine the best approach by evaluating the purpose of the design. ○ 7X - Document trade-offs in the technology and engineering design process to produce the optimal design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7Z - Apply principles of human-centered design. ○ 7AA - Illustrate principles, elements, and factors of design.	○ 7BB - Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process. ○ 7DD - Apply a broad range of making skills to their design process. • Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. ○ 8O - Develop a device or system for the marketplace. ○ 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.

Unit 1: Safety

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8P	<i>Students will understand that...</i> ● Consistently following safety procedures minimizes the risk of injury and ensures a productive and efficient woodworking environment. ● Tools and machinery must be used correctly and maintained properly to reduce hazards and enhance precision and craftsmanship in woodworking projects. ● Responsible habits in the workshop fosters a culture of safety that extends beyond woodworking into everyday life and future careers.	<i>Students will consider...</i> ● Why is it important to know and follow proper safety procedures? ● What are the proper safety procedures for working in an industrial environment? ● What are the safety rules for the use of hand and power tools?
Learning Targets		
<i>Students will...</i> ● Demonstrate the proper ways to use tools safely in the shop. ● Follow all safety procedures while working in the shop.		
Unit Duration:		
Throughout entire course		

Unit 2: Planning & Layout

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 7: Design in Technology and Engineering Education 7W, 7X	<i>Students will understand that...</i> - Accurate measurements, detailed drawings, and thoughtful planning are essential for creating functional and aesthetically pleasing woodworking projects. - Careful planning and layout maximize material efficiency, minimize waste, and promote sustainable woodworking and machining practices. - Developing a structured plan before cutting and assembling ensures a smoother building process, reduces costly mistakes, and improves overall project success.	<i>Students will consider...</i> - Why is accuracy important when measuring? - Why is it important to follow a universal template when designing plans? - What are the tools used for layout and measuring? - How do you properly fill out a bill of materials? - What are the tools used for layout and measuring?
Learning Targets		
<i>Students will...</i> - Know the proper tools for layout and measuring. - Be able to utilize these tools to properly layout projects in preparation of the build. - Understand what bill of materials is and be able to properly complete a bill of materials.		
Unit Duration:		
1-2 Weeks		

Unit 3: Project Build

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 7: Design in Technology and Engineering Education 7Y, 7Z, 7AA, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N, 8O, 8P	<i>Students will understand that...</i> - Skilled woodworkers must understand the function, maintenance, and safe handling of hand tools, power tools, and machinery to ensure precision, efficiency, and personal safety in the manufacturing process. - The ability to apply various joinery and assembly methods, such as adhesives, fasteners, and mechanical connections, is essential for building durable and high-quality projects that meet functional and design requirements. - Understanding technical drawings, material lists, and step-by-step instructions allows students to efficiently construct projects, troubleshoot challenges, and ensure accuracy from concept to completion.	<i>Students will consider...</i> - Why is it important to select the appropriate tools? - What are the basic techniques used in power sawing? - What are the basic techniques used in forming and shaping? - How do you properly use the various tools in the class and what are they used for? - Why is it important to know the differences between assembly joints? - What components are used in the assembly process? - What are the basic techniques used in assembly? - Why is it important to follow a universal template when designing plans? - What components are used in the finishing process?
Learning Targets		
<i>Students will...</i> - Identify the proper tools for sawing, forming and shaping. - Safely utilize various tools to create a variety of projects. - Demonstrate various assembly and finishing techniques in the completion of a project.		
Unit Duration:		
1 week - 5 weeks		

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
Week 1-3	Safety	Woodworking	Students will know and demonstrate the proper ways to use tools safely in the shop.	- Safety Test - Work with tools, machines, etc. on various projects - Demonstrate proper use of safeguards such as safety goggles, dust masks, ear plugs, and other Personal Safety Equipment while working on projects.
Week 4-5	Planning & Layout	Bill of Materials Data Sheet	- Students will know the proper tools for layout and measuring. - Students will be able to utilize these tools to properly layout projects in preparation of the build.	- Completed Bill of Materials - Projects built to accurate dimensions
Week 5-18	Tool Skills, Joinery Skills, Finish Skills (Project Builds)	- Tool Demonstrations - Video Demonstrations	- Students will know what a bill of materials is and be able to properly complete a bill of materials. - Students will know the proper tools for sawing, forming and shaping. - Students will be able to utilize various tools to create a variety of projects. - Students will be able to use various assembly and finishing techniques in the completion of	- Completed Projects with popper assembly and finishing - Proper use of forming, shaping, hand tools and power tools - Terminology Quiz - Final Exam

			a project.	
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Proficiency Scales for Woodworking and Material Processes

Grade Level/Course: Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ P Domain: Safety
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	• Safety test • Work with tools, machines, etc. on various projects • Demonstrate proper use of safeguards such as safety goggles, dust masks, ear plugs, and other Personal Safety Equipment while working on projects.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. • Demonstrates the proper use of safety while working in the shop, follows all safety procedures, and uses all tools in the correct manner to prevent damage and/or injury. • Follows expectations regarding specific tool, machines and general shop safety	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. • Can recite or recall proper safety procedures	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. • Can identify the tools, etc. in the shop	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ W ○ ITEEA Standard 7: Design in Technology and Engineering Education ■ W, X Domain: Planning and Layout
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Complete a Bill of Materials ● Knowledge of terminology
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Complete a bill of materials, which includes a cutting diagram, stock cutting list, and material cost list.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Differentiate the stock cutting list, material cost, and cutting diagram	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Recognizes or recalls specific terminology, such as: stock cutting list, material cost list, cutting diagram	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ W Domain: Tools
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Properly using hand tools ● Properly using power tools
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Properly use the power miter saw, table saw, band saw, and scroll saw to rip and crosscut various types of wood. ● Properly use various hand tools.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Identify the different tools, such as drills, bits, saws, etc...	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Differentiate between power tools and hand tools.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 7: Design in Technology and Engineering Education ■ Y, Z, AA, BB, CC, DD Domain: Forming and Shaping
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Proper use of forming and shaping tools to perform various operations ● Quiz on terminology
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Demonstrate appropriate and safe use the jointer, planer, lathe, drill press, router, and pedestal sander.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Recognizes or recalls specific terminology, such as: ● Jointer, planer, lathe, drill press, router, and pedestal sander.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Can use non powered tools for forming and shaping	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ N, O, P Domain: Assembly
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Properly assemble projects together ● Knowledge of terminology
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Uses a variety of techniques in order to glue, clamp and assemble projects together.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Differentiate between a butt joint and rabbet joint	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Recognizes or recalls specific terminology, such as: Glue Joints, fasteners, and clamping	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ N, O, P Domain: Finishing
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Paint different projects ● Stain Different projects
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Prep, paint or stain, and clean up properly in a variety of applications.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Recognizes or recalls specific terminology, such as: Trimming, Rolling, Textures, Striping, Latex, Oil based, Primer, Stain, Clear finishes	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identifies different tools used for painting	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Advanced Woodworking and Material Processes

Course Overview

Grade level(s): 10-12	Credits earned: 1 credit (full year course) Prerequisite: Woodworking and Material Processes or Home Repairs and the recommendation of an instructor
Course Description	
This is an advanced lab class in which the student chooses from a variety of projects on an individual basis. These include, but are not limited to woodworking, school improvement projects, maintenance, landscaping, and building. There are no specific required projects. Students are to design and construct a project(s) of their own choosing. The total cost for the course will depend upon the amount of materials used. Students are required to pay for the materials to complete each project (unless it is a school improvement project).	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses National standards for Industrial Technology) • Standard 2: Core Concepts of Technology and Engineering ○ 2W - Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste, while solving problems. • Standard 7: Design in Technology and Engineering Education ○ 7W - Determine the best approach by evaluating the purpose of the design. ○ 7X - Document trade-offs in the technology and engineering design process to produce the optimal design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7Z - Apply principles of human-centered design.	○ 7BB - Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process. ○ 7DD - Apply a broad range of making skills to their design process. • Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. ○ 8O - Develop a device or system for the marketplace. ○ 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.

- 7AA - Illustrate principles, elements, and factors of design.

Unit 1: Safety

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8P	<i>Students will understand that...</i> ● Consistently following safety procedures minimizes the risk of injury and ensures a productive and efficient woodworking environment. ● Tools and machinery must be used correctly and maintained properly to reduce hazards and enhance precision and craftsmanship in woodworking projects. ● Responsible habits in the workshop fosters a culture of safety that extends beyond woodworking into everyday life and future careers.	<i>Students will consider...</i> ● Why is it important to know and follow proper safety procedures? ● What are the proper safety procedures for working in an industrial environment? ● What are the safety rules for the use of hand and power tools?
Learning Targets		
<i>Students will...</i> ● Know and demonstrate the proper ways to use tools safely in the shop. ● Follow all safety procedures while working in the shop.		
Unit Duration:		
Throughout entire course		

Unit 2: Planning & Layout

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD	<i>Students will understand that...</i> - Accurate measurements, detailed drawings, and thoughtful planning are essential for creating functional and aesthetically pleasing woodworking projects. - Careful planning and layout maximize material efficiency, minimize waste, and promote sustainable woodworking and machining practices. - Developing a structured plan before cutting and assembling ensures a smoother building process, reduces costly mistakes, and improves overall project success.	<i>Students will consider...</i> - Why is accuracy important when measuring? - Why is it important to follow a universal template when designing plans? - What are the tools used for layout and measuring? - How do you properly fill out a bill of materials? "What are the tools used for layout and measuring?"
Learning Targets		
<i>Students will...</i> - Know the proper tools for layout and measuring. - Be able to utilize these tools to properly layout projects in preparation of the build. - Understand what a bill of materials is and be able to properly complete a bill of materials.		
Unit Duration:		
1-2 Weeks		

Unit 3: Project Build

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 7: Design in Technology and Engineering Education 7Y, 7Z, 7AA, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N, 8O, 8P	<i>Students will understand that...</i> - Skilled woodworkers must understand the function, maintenance, and safe handling of hand tools, power tools, and machinery to ensure precision, efficiency, and personal safety in the manufacturing process. - The ability to apply various joinery and assembly methods, such as adhesives, fasteners, and mechanical connections, is essential for building durable and high-quality projects that meet functional and design requirements. - Understanding technical drawings, material lists, and step-by-step instructions allows students to efficiently construct projects, troubleshoot challenges, and ensure accuracy from concept to completion.	<i>Students will consider...</i> - Why is it important to select the appropriate tools? - What are the advanced techniques used in power sawing? - What are the advanced techniques used in forming and shaping? - How do you properly use the various tools in the class and what are they used for? - Why is it important to know the differences between assembly joints? - What advanced tools are used in the assembly process? - What are the advanced techniques used in assembly? - What are the advanced techniques used in finishing a project? - What components are used in the finishing process? - How and why would advanced finishing techniques be used?
Learning Targets		
<i>Students will...</i> - Identify the proper tools for advanced methods in sawing, forming and shaping. - Safely utilize various tools to create a variety of projects. - Demonstrate various advanced assembly and finishing techniques in the completion of a project.		
Unit Duration:		

12 weeks

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
Week 1-3	Safety	• Woods Book • Safety tutorials	• Students will know and demonstrate the proper ways to use tools safely in the shop. • Students will follow all safety procedures while working in the shop.	• Safety Test • Work with tools, machines, etc. on various projects • Demonstrate proper use of safeguards such as safety goggles, dust masks, ear plugs, and other Personal Safety Equipment while working on projects.
Week 4-5	Planning & Layout	• Bill of Materials Data Sheet	• Students will know the proper tools for layout and measuring. • Students will be able to utilize these tools to properly layout projects in preparation of the build. • Students will understand what a bill of materials is and be able to properly complete a bill of materials.	• Completed Bill of Materials • Projects built to accurate dimensions • Terminology Quiz
Week 5-18	Tool Skills, Joinery Skills, Finish Skills	• Tools and materials • Live Demonstrations • Video Demonstrations	• Students will identify the proper tools for advanced methods in sawing, forming and shaping. • Students will safely utilize various tools to create a variety of projects. • Students will demonstrate various advanced assembly and finishing techniques in the	• Completed Projects (ex. table, stool, night stand, cabinet, cutting board, etc.) • Final Exam

			completion of a project.	
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Proficiency Scales for Advanced Woodworking and Material Processes

Grade Level/Course: Advanced Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ P Domain: Safety
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	• Safety test • Work with tools, machines, etc. on various projects • Demonstrate proper use of safeguards such as safety goggles, dust masks, ear plugs, and other Personal Safety Equipment while working on projects.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. • Demonstrate the proper use of safety while working in the shop, follow all safety procedures, and use all tools in the correct manner to prevent damage and/or injury. • Follows expectations regarding specific tool, machines and general shop safety	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. • Can recite or recall proper safety procedures	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. • Can identify the tools, etc. in the shop	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Advanced Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ W ○ ITEEA Standard 7: Design in Technology and Engineering Education ■ W, X, Y, Z, AA, BB, CC, DD Domain: Planning and Layout
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Complete a Bill of Materials ● Terminology quiz
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Students will be able to complete a bill of materials, which includes a cutting diagram, stock cutting list, and material cost list.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Can differentiate terminology, such as: Stock cutting list, Material cost list, Cutting diagram	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Recognizes or recalls specific terminology, such as: Stock cutting, Cutting diagram	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Advanced Woodworking and Material Processes	Standard(s): ○ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ N, O, P Domain: Project Build
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	A completed project. Examples would be tables, stools, night stands, cabinets, cutting boards etc...
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. Uses a variety of techniques in order to glue, clamp and assemble projects together.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. - Recognizes or recalls specific terminology, such as: - Glue Joints, fasteners, and clamping	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. Demonstrates understanding of why we glue and assemble projects	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Robotics

Course Overview

Grade level(s): 9-12	Credits earned: ½ credit (semester course)
Course Description	
This course is an intro to robotics. We will be utilizing various robotics kits and materials. The objective is to introduce the student to basic programming as well as problem-solving strategies. This course will involve students in the development, building, and programming of a robot. Students will work hands-on in teams to design, build, program, and document their progress. Topics may include motor control, gear ratios, torque, friction, sensors, program loops, decision-making, and timing sequences.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses national standards for Industrial Technology) • Standard 7: Design in Technology and Engineering Education ○ 7W - Determine the best approach by evaluating the purpose of the design. ○ 7X - Document trade-offs in the technology and engineering design process to produce the optimal design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7Z - Apply principles of human-centered design. ○ 7AA - Illustrate principles, elements, and factors of design. ○ 7BB - Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process. ○ 7DD - Apply a broad range of making skills to their design process. • Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. ○ 8O - Develop a device or system for the marketplace. ○ 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.	International Society for Technology in Education (ISTE) • 1.4 Innovative Designer ○ 1.4a - Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. ○ 1.4b - Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. ○ 1.4c - Students develop, test and refine prototypes as part of a cyclical design process. ○ 1.4d - Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems. • 1.5 Computational Thinker ○ 1.5d - Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Unit 1: Design Process/Robot Design

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD ISTE 1.4 Innovative Designer - a, b, c, d 1.5 Computational Thinker - d	<i>Students will understand that...</i> - Design decisions are influenced by real-world constraints, including materials, technology, time, and user needs. - Successful robotic designs require testing, evaluation, and refinement to meet criteria and constraints effectively. - Engineering is an iterative process that involves problem-solving, creativity, and continuous improvement.	<i>Students will consider...</i> - What are the steps to program motors and sensors to complete tasks? - What are the steps involved from start to finish in the Design Process? - What factors influence the success or failure of a robotic design? - How does the design of a robot impact its functionality and ability to interact with its environment?
Learning Targets		
<i>Students will...</i> - Describe the steps of the engineering design process and apply them to develop a robotic solution to a given problem. - Demonstrate the importance of the design process through brainstorming and following their instructions for each set of problems. - Brainstorm multiple design ideas, select the most feasible solution, and create a functional prototype using appropriate materials and technology. - Document my design process and articulate my design decisions. - Define a design challenge by identifying constraints, criteria, and stakeholder needs.		
Unit Duration:		
Ongoing throughout the semester		

Unit 2: Robot Build

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N, 8O, 8P ISTE 1.4 Innovative Designer - a, b, c, d	<i>Students will understand that...</i> - The structure and design of a robot directly impact its performance, functionality, and ability to complete tasks. - Engineering principles such as force, balance, and mechanical advantage play a critical role in building effective robotic systems. - Successful robot construction requires precision, problem-solving, and iteration to optimize performance. - Safe and proper use of tools, materials, and equipment is essential for effective and responsible engineering.	<i>Students will consider...</i> - How do the physical components of a robot influence its performance and functionality? - What structural and mechanical principles must be considered when building a robot? - How can we systematically troubleshoot and improve a robot's build? - What role does iteration play in refining a robotic system? - Why is safety important in robotics, and how can we ensure best practices when building? - How do real-world engineering challenges influence robotic design and construction?
Learning Targets		
<i>Students will...</i> - Build robots according to the design they came up with or a design that was provided for them. - Explain the function of key robotic components, including motors, sensors, gears, and structural elements.		
Unit Duration:		
Ongoing throughout the semester		

Unit 3: Programming

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N, 8O, 8P ISTE - ISTE 1.5 Computational Thinker - d	<i>Students will understand that...</i> - Programming is essential for robots to interpret data, make decisions, and complete tasks autonomously. - Logical thinking, problem-solving, and debugging are critical skills for writing efficient and effective code. - Algorithms and control structures (such as loops and conditionals) allow robots to perform tasks with precision and adaptability. - Programming involves continuous testing and refinement to improve efficiency, accuracy, and reliability. - Real-world robotic applications rely on programming to interact with and respond to dynamic environments.	<i>Students will consider...</i> - How do robots use programming to sense, process, and respond to their environment? - What strategies can be used to write efficient and error-free code for robotic tasks? - How do loops, conditionals, and variables improve a robot's functionality? - Why is debugging an important part of programming, and how can we systematically identify and fix errors? - How does robotics programming mirror real-world problem-solving in automation, AI, and other industries?
Learning Targets		
<i>Students will...</i> - Program their robots in autonomous mode according to the design they came up with or a design that was given to them. - Create a driver controlled robot program to accomplish a complex challenge (multi-step/functions).		
Unit Duration:		
Ongoing throughout the semester		

Unit 4: Test and Evaluate

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7AA, 7BB - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P ISTE 1.4 Innovative Designer - C	<i>Students will understand that...</i> Testing and evaluating how the Robot performs and making the necessary adjustments as needed is an iterative design process.	<i>Students will consider...</i> - How is the Robot completing the task? - Are there any changes that need to be made to the Robot to complete the task?
Learning Targets		
<i>Students will...</i> - Test and evaluate their robot according to the design they came up with or a design that was given to them. - Use results of robotic challenges to make necessary improvements/revisions.		
Unit Duration:		
Ongoing throughout the semester		

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
Design- Ongoing throughout the semester	Design Process	Lego Mindstorms Computer Integrated Manufacturing Real World Vehicles VEX Robotics VEX Code	- Students will describe the steps of the engineering design process and apply them to develop a robotic solution to a given problem. - Students will demonstrate the importance of the design process through brainstorming and following their instructions for each set of problems. - Students will brainstorm multiple design ideas, select the most feasible solution, and create a functional prototype using appropriate materials and technology. - Students will document my design process and articulate my design decisions. - Students will define a design challenge by identifying constraints, criteria, and stakeholder needs.	Design robots with appropriate motors sensors and mechanisms to complete a given challenge or competition.
Robot Build- Ongoing throughout the semester	Robot Build	Lego Mindstorms Computer Integrated Manufacturing Real World Vehicles VEX Robotics VEX Code	- Students will build robots according to the design they came up with or a design that was provided for them. - Students will explain the function of key robotic components, including motors, sensors, gears, and structural elements.	Build robots with appropriate motors sensors and mechanisms to complete a given challenge or competition.
Autonomous Programming - Ongoing throughout the semester	Autonomous Programming	Lego Mindstorms Computer Integrated Manufacturing Real World Vehicles VEX Robotics VEX Code	- Students will program their robots in autonomous mode according to the design they came up with or a design that was given to them. - Students will create a driver controlled robot program to accomplish a complex challenge (multi-step/functions).	- Program robot motors and sensors to complete a given challenge or competition. - Simple vs. Complex challenges

				defined in challenge rubric
Test and Evaluate - Ongoing throughout the semester	Test and Evaluate	Lego Mindstorms • Computer Integrated Manufacturing • Real World Vehicles VEX Robotics • VEX Code	• Students will test and evaluate their robot according to the design they came up with or a design that was given to them. • Students will use results of robotic challenges to make necessary improvements/revisions.	• Test the robot against the given challenge, evaluate the robot's performance and make changes when necessary.

Proficiency Scales for Robotics

Grade Level/Course: Robotics	Standard(s): ○ ITEEA Standard 7: Design in Technology and Engineering Education ■ W , X, Y, Z, AA, BB, CC, DD ○ ISTE 1.4 Innovative Designer ■ a, b, c, d ○ ISTE 1.5 Computational Thinker ■ d Domain: Robot Design
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	Design robots with appropriate motors sensors and mechanisms to complete a given challenge or competition.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. Design an original robot that will be able to accomplish a complex predetermined task as defined by a rubric.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. There are no major errors or omissions regarding the simpler details and processes as the student: Design with an original robot design that will be able to accomplish a simple predetermined task as defined by a rubric.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. Alter the base bot design to accomplish a predetermined task.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Robotics	Standard(s): ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ N, O, P ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ W, X, Y, Z, AA, BB, CC, DD ■ ISTE 1.4 Innovative Designer ■ a, b, c, d Domain: Robot Build
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	Build robots with appropriate motors sensors and mechanisms to complete a given challenge or competition.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. Create an original robot that will mechanically be able to accomplish a complex predetermined task.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. - Create an original robot that will mechanically be able to accomplish a simple predetermined task. - Identify and explain the function of key robotic components, including motors, sensors, gears, and structural elements.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. - Identify the proper components used to complete the task. - Add to or alter the basebot design to accomplish a predetermined task.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Robotics	Standard(s): ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ N, O, P ■ ISTE 1.5 Computational Thinker ■ d Domain: Robot Programming
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Program robot motors and sensors to complete a given challenge or competition. ○ Simple vs. Complex challenges defined in challenge rubric
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Create an autonomous robot program using multiple movements and sensors to accomplish a complex challenge . ● Create a driver controlled robot program to accomplish a complex challenge.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Create an autonomous robot program using multiple movements and sensors to accomplish a simple challenge. ● Create a driver controlled robot program to accomplish a simple challenge.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Program to accomplish a given task. ● Identify the program used to program that robot.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Robotics	Standard(s): ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ W, X, Y, Z, AA, BB ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ P ■ ISTE 1.4 Innovative Designer ■ C Domain: Robot Test & Evaluate
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	Test the robot against the given challenge, evaluate the robot's performance and make changes when necessary.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. Test robot within the given challenge, evaluate the success and failure points, and use that data to improve the construction and/or program.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. Test robot within the given challenge, evaluate the success and failure points, and explain what they think needs to be done to improve robot performance..	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. Point out/Identify specific flaws in their robot.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Advanced Robotics

Course Overview

Grade level(s): 10-12	Credits earned: 1 credit (full year course) Prerequisite: Robotics and teacher approval
Course Description	
Students will dive deeper into the field of robotics using various and more advanced robotic platforms. Students will work hands-on in teams to design, build, program, and document their progress. Students will use the robots they design, build and program to compete in class competitions.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses national standards for Industrial Technology) • Standard 7: Design in Technology and Engineering Education ○ 7W - Determine the best approach by evaluating the purpose of the design. ○ 7X - Document trade-offs in the technology and engineering design process to produce the optimal design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7Z - Apply principles of human-centered design. ○ 7AA - Illustrate principles, elements, and factors of design. ○ 7BB - Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process. ○ 7DD - Apply a broad range of making skills to their design process. • Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. ○ 8O - Develop a device or system for the marketplace.	International Society for Technology in Education (ISTE) • 1.4 Innovative Designer ○ 1.4a - Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. ○ 1.4b - Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. ○ 1.4c - Students develop, test and refine prototypes as part of a cyclical design process. ○ 1.4d - Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems. • 1.5 Computational Thinker ○ 1.5d - Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

- 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.

Unit 1: Robot Design

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ● Standard 7: Design in Technology and Engineering Education ○ 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD ISTE ■ 1.4 Innovative Designer ■ a, b, c, d ■ 1.5 Computational Thinker ■ d	<i>Students will understand that...</i> ● Design decisions are influenced by real-world constraints, including materials, technology, time, and user needs. ● Successful robotic designs require testing, evaluation, and refinement to meet criteria and constraints effectively. ● Engineering is an iterative process that involves problem-solving, creativity, and continuous improvement.	<i>Students will consider...</i> ● What are the steps to program motors and sensors to complete tasks? ● What are the steps involved from start to finish in the Design Process? ● What factors influence the success or failure of a robotic design? ● How does the design of a robot impact its functionality and ability to interact with its environment?

Learning Targets

Students will...

- Apply the design process to solve problems
- Use design software to design and model possible design solutions
- Systematically and effectively develop a solution to a given problem

Unit Duration:

Ongoing throughout the semester.

Unit 2: Robot Build

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N, 8O, 8P ISTE 1.4 Innovative Designer - a, b, c, d	<i>Students will understand that...</i> - The structure and design of a robot directly impact its performance, functionality, and ability to complete tasks. - Engineering principles such as force, balance, and mechanical advantage play a critical role in building effective robotic systems. - Successful robot construction requires precision, problem-solving, and iteration to optimize performance. - Safe and proper use of tools, materials, and equipment is essential for effective and responsible engineering.	<i>Students will consider...</i> - How do the physical components of a robot influence its performance and functionality? - What structural and mechanical principles must be considered when building a robot? - How can we systematically troubleshoot and improve a robot's build? - What role does iteration play in refining a robotic system? - Why is safety important in robotics, and how can we ensure best practices when building? - How do real-world engineering challenges influence robotic design and construction?
Learning Targets		
<i>Students will...</i> - Build their robots according to the design they came up with or a design that was given to them. - Explain the function of key robotic components, including motors, sensors, gears, and structural elements.		
Unit Duration:		
Ongoing throughout the semester		

Unit 3: Programming

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N, 8O, 8P ISTE - ISTE 1.5 Computational Thinker - d	<i>Students will understand that...</i> - Programming is essential for robots to interpret data, make decisions, and complete tasks autonomously. - Logical thinking, problem-solving, and debugging are critical skills for writing efficient and effective code. - Algorithms and control structures (such as loops and conditionals) allow robots to perform tasks with precision and adaptability. - Programming involves continuous testing and refinement to improve efficiency, accuracy, and reliability. - Real-world robotic applications rely on programming to interact with and respond to dynamic environments.	<i>Students will consider...</i> - How do robots use programming to sense, process, and respond to their environment? - What strategies can be used to write efficient and error-free code for robotic tasks? - How do loops, conditionals, and variables improve a robot's functionality? - Why is debugging an important part of programming, and how can we systematically identify and fix errors? - How does robotics programming mirror real-world problem-solving in automation, AI, and other industries?

Learning Targets

Students will...

- Program their robots in autonomous mode according to the design they came up with or a design that was given to them.
- Create a driver controlled robot program to accomplish a complex challenge (multi-step/functions).

Unit Duration:

Ongoing throughout the semester

Unit 4: Test and Evaluate

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7AA, 7BB - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P ISTE 1.4 Innovative Designer - c	<i>Students will understand that...</i> - Testing and evaluation are critical steps in the engineering design process that lead to improved robotic performance. - Data collection and analysis help identify strengths, weaknesses, and areas for improvement in a robot's design and programming. - Iteration and refinement are necessary to enhance a robot's efficiency, accuracy, and reliability in performing tasks. - Systematic troubleshooting helps engineers identify and resolve mechanical and programming issues effectively. - Real-world robotics applications require ongoing testing, adaptation, and optimization to function successfully in dynamic environments.	<i>Students will consider...</i> - Why is testing an essential part of the engineering and design process? - How can we systematically evaluate a robot's performance to identify areas for improvement? - What strategies can be used to troubleshoot mechanical or programming issues in a robot? - How do data and observations inform design and programming modifications? - Why is iteration important, and how do engineers decide when a robot is ready for real-world application?
Learning Targets		
<i>Students will...</i> - Test the robot's functionality by collecting and analyzing data to assess its performance.. - Identify and troubleshoot mechanical and programming issues, making modifications to improve efficiency and accuracy. - Refine and iterate robot's design and code to optimize its ability to complete assigned tasks.		
Unit Duration:		

Ongoing throughout the semester

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
Design- Ongoing throughout the semester	Design Process	Lego Mindstorms Computer Integrated Manufacturing Real World Vehicles VEX Robotics VEX Code	- Students will apply the design process to solve problems - Students will use design software to design and model possible design solutions - Students will systematically and effectively develop a solution to a given problem	Design robots with appropriate motors sensors and mechanisms to complete a given challenge or competition.
Robot Build- Ongoing throughout the semester	Robot Build	Lego Mindstorms Computer Integrated Manufacturing Real World Vehicles VEX Robotics VEX Code	- Students will build their robots according to the design they came up with or a design that was given to them. - Students will explain the function of key robotic components, including motors, sensors, gears, and structural elements.	Build robots with appropriate motors sensors and mechanisms to complete a given challenge or competition.
Programming - Ongoing throughout the semester	Programming	Lego Mindstorms Computer Integrated Manufacturing Real World Vehicles VEX Robotics VEX Code	- Students will program their robots in autonomous mode according to the design they came up with or a design that was given to them. - Students will create a driver controlled robot program to accomplish a complex challenge (multi-step/functions).	- Program robot motors and sensors to complete a given challenge or competition. - Simple vs. Complex challenges defined in challenge rubric
Test and Evaluate - Ongoing throughout the semester	Test and Evaluate	Lego Mindstorms Computer Integrated Manufacturing Real World Vehicles VEX Robotics VEX Code	- Students will test the robot's functionality by collecting and analyzing data to assess its performance.. - Students will identify and troubleshoot mechanical and programming issues, making modifications to improve efficiency and accuracy.	Test the robot against the given challenge, evaluate the robot's performance and make changes when necessary.

- Students will refine and iterate the robot's design and code to optimize its ability to complete assigned tasks.

Proficiency Scales for Advanced Robotics

Grade Level/Course: Advanced Robotics	Standard(s): ○ ITEEA Standard 7: Design in Technology and Engineering Education ■ W , X, Y, Z, AA, BB, CC, DD ○ ISTE 1.4 Innovative Designer ■ a, b, c, d ○ ISTE 1.5 Computational Thinker ■ d Domain: Robot Design
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	• Design robots with appropriate motors sensors and mechanisms to complete a given challenge or competition.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. • Design an original robot design that will be able to accomplish a complex predetermined task as defined by the rubric.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. • Design an original robot design that will be able to accomplish a simple predetermined task as defined by the rubric.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. • Alter the base bot design to accomplish a predetermined task.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: Advanced Robotics	Standard(s): ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ N, O, P ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ W, X, Y, Z, AA, BB, CC, DD ■ ISTE 1.4 Innovative Designer ■ a, b, c, d Domain: Robot Build
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	Build robots with appropriate motors sensors and mechanisms to complete a given challenge or competition.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. Create an original robot that will mechanically be able to accomplish a complex predetermined task.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. - Create an original robot that will mechanically be able to accomplish a simple predetermined task. - Identify and explain the function of key robotic components, including motors, sensors, gears, and structural elements.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. - Identify the proper components used to complete the task. - Add to or alter the basebot design to accomplish a predetermined task.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: Advanced Robotics	Standard(s): ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ N, O, P ■ ISTE 1.5 Computational Thinker ■ d Domain: Robot Programming
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Program robot motors and sensors to complete a given challenge or competition. ○ Simple vs. Complex challenges defined in challenge rubric
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Create an autonomous robot program using multiple movements and sensors to accomplish a complex challenge . ● Create a driver controlled robot program to accomplish a complex challenge.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Create an autonomous robot program using multiple movements and sensors to accomplish a simple challenge. ● Create a driver controlled robot program to accomplish a simple challenge.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Program to accomplish a given simple task. ● Identify the program used to program that robot.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: Advanced Robotics	Standard(s): ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ W, X, Y, Z, AA, BB ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ P ■ ISTE 1.4 Innovative Designer ■ C Domain: Robot Test & Evaluate
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	Test the robot against the given challenge, evaluate the robot's performance and make changes when necessary.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. - Test the robot's functionality by collecting and analyzing data to assess its performance.. - Identify and troubleshoot mechanical and programming issues, making modifications to improve efficiency and accuracy. - Refine and iterate robot's design and code to optimize its ability to complete assigned tasks.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. Test robot within the given challenge, evaluate the success and failure points, and explain what they think needs to be done to improve robot performance..	

1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. ● Point out/Identify specific flaws in their robot.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Introduction to Digital Technology (Intro to Digital Tech)

Course Overview

Grade level(s): 9-12	Credits earned: ½ credit (semester course)
Course Description	
Intro to Digital Tech is an introduction to many different technologies. Fun, interactive learning tools help promote science, technology, engineering, and math. This class offers design, visualization, and simulation capabilities so students can easily transition between 2D and 3D design environments, and fully experience their creative ideas digitally. The possibilities of software applications the students will be introduced to include engineering, architecture, video editing, and special effects. For further explanation, see the Industrial Technology instructor. The lab fee covers materials for projects done in class.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
<u>ITEEA Standards for Technological and Engineering Literacy</u> grades 9-12 (MO uses national standards for Industrial Technology) • Standard 1: Nature and Characteristics of Technology and Engineering ○ 1N - Explain how the world around them guides technological development and engineering design. ○ 1O - Assess how similarities and differences among scientific, mathematical, engineering, and technological knowledge contribute to the design of a product or system. ○ 1Q - Conduct research to inform intentional inventions and innovations that address specific needs and wants. ○ 1R – Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system. • Standard 2: Core Concepts of Technology and Engineering ○ 2T - Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.	<u>International Society for Technology in Education (ISTE)</u> • 1.1 Empowered Learner ○ d - Students understand fundamental concepts of how technology works, demonstrate the ability to choose and use current technologies effectively, and are adept at thoughtfully exploring emerging technologies. • 1.2 Digital Citizen ○ b - Students demonstrate empathetic, inclusive interactions online and use technology to responsibly contribute to their communities. • 1.4 Innovative Designer ○ b - Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. • 1.5 Computational Thinker ○ d - Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. • 1.6 Creative Communicator

○ 2V – Analyze the stability of a technological system and how it is influenced by all the components in the system, especially those in the feedback loop. ○ 2X - Cite examples of the criteria and constraints of a product or system and how they affect final design. ○ 2Z – Use management processes in planning, organizing, and controlling work. ● Standard 3: Integration of Knowledge, Technologies, and Practices ○ 3J - Connect technological progress to the advancement of other areas of knowledge, and vice versa. ● Standard 4: Impacts of Technology ○ 4P - Evaluate ways that technology can impact individuals, society, and the environment. ○ 4T – Evaluate how technologies alter human health and capabilities. ● Standard 7: Design in Technology and Engineering Education ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7AA – Illustrate principles, elements, and factors of design. ○ 7BB – Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process.	○ a - Students choose the appropriate platforms and digital tools for meeting the desired objectives of their creation or communication. ● 1.7 Global Collaborator ○ c - Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
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Unit 1: AutoCAD

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering - N - Standard 2: Core Concepts of Technology and Engineering - T, X - Standard 3: Integration of Knowledge, Technologies, and Practices - J - Standard 7: Design in Technology and Engineering Education - Y ISTE 1.1 Empowered Learner - d 1.4 Innovative Designer - b 1.5 Computational Thinker - d 1.6 Creative Communicator - a	<i>Students will understand that...</i> - Precision and accuracy in technical drawings are essential for real-world applications in engineering, architecture, and manufacturing. - AutoCAD provides a digital platform for creating and modifying detailed 2D and 3D designs efficiently. - Understanding industry standards and best practices in drafting ensures consistency and clarity in technical communication. - Layer management, scaling, and dimensioning are critical elements in producing clear and effective drawings.	<i>Students will consider...</i> - Why is accuracy and precision important in technical drawings? - How does AutoCAD streamline the design and drafting process compared to manual drafting? - What role do industry standards and best practices play in creating professional drawings? - How do layers, scaling, and dimensioning improve the readability of a technical drawing?
Learning Targets		
<i>Students will...</i> - Create and Modify 2D technical drawings using fundamental AutoCAD tools. - Apply proper dimensioning, scaling, and layering to improve the clarity of my designs. - Use commands such as trim, extend, fillet, and offset to refine and optimize my drawings. - Follow industry drafting standards to produce professional-quality technical drawings.		

Unit Duration:
4 weeks

Unit 2: Inventor

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering - O - Standard 2: Core Concepts of Technology and Engineering - T, Y - Standard 4: Impacts of Technology - P - Standard 7: Design in Technology and Engineering Education - CC ISTE 1.1 Empowered Learner - d 1.4 Innovative Designer - b 1.5 Computational Thinker - d 1.6 Creative Communicator - a	<i>Students will understand that...</i> 3D modeling allows engineers and designers to visualize, analyze, and refine products before manufacturing. - Parametric modeling provides flexibility for design changes and optimizations. - Understanding constraints, assemblies, and material properties is crucial for real-world product design. - Inventor streamlines the prototyping process by enabling rapid iteration and visualization.	<i>Students will consider...</i> - How do you create a 3D image on Inventor? - What are the basic functions of the inventor Program? - How does 3D modeling improve the product design and manufacturing process? - What advantages does parametric modeling provide over traditional drafting techniques? - How do constraints and assemblies affect the functionality of a design? - What are the key considerations when designing a part or assembly for manufacturing?
Learning Targets		
<i>Students will...</i> - Create and modify 3D models using parametric design techniques in Autodesk Inventor. - Apply geometric and dimensional constraints to maintain design accuracy. - Assemble multiple parts and ensure correct movement and alignment..		

- Generate technical drawings and exploded views from a 3D model.

Unit Duration:

4 weeks

Unit 3: Robotics

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy • Standard 1: Nature and Characteristics of Technology and Engineering ◦ R • Standard 2: Core Concepts of Technology and Engineering ◦ V, Z • Standard 4: Impacts of Technology ◦ T • Standard 7: Design in Technology and Engineering Education ◦ BB ISTE • 1.1 Empowered Learner ◦ d • 1.4 Innovative Designer ◦ b • 1.5 Computational Thinker ◦ d • 1.7 Global Collaborator ◦ c	<i>Students will understand that...</i> • Robotic systems integrate mechanical, electrical, and programming components to perform tasks • The engineering design process is essential for designing, testing, and improving robotic systems. • Programming allows robots to respond to sensor inputs and perform automated tasks. • Troubleshooting and iteration are critical in optimizing robot performance.	<i>Students will consider...</i> • How will you design and program your Robot? • What are the steps involved from start to finish in the Design Process? • What steps are you going to take in order to ensure that the robot will function according to the specifications? • What steps are you going to take in order to ensure that the robot will function according to the specifications? • How do mechanical design, electronics, and programming work together in a robot? • What steps are involved in designing and building a functional robot? • How does programming enable automation in robotics? • What methods can be used to troubleshoot and improve robot performance?
Learning Targets		

<i>Students will...</i> ● Design, build, and program a functional robot according to specifications. ● Write and modify code to program a robot for autonomous and driver-controlled tasks. ● Use sensors to allow a robot to interact with its environment. ● Systematically test, troubleshoot, and improve a robot's performance.
Unit Duration:
4 weeks

Unit 4: Video Productions <i>Desired Results</i>		
Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ● Standard 1: Nature and Characteristics of Technology and Engineering ○ Q ● Standard 2: Core Concepts of Technology and Engineering ○ T ● Standard 7: Design in Technology and Engineering Education ○ AA ISTE ● 1.1 Empowered Learner ○ d ● 1.2 Digital Citizen ○ b ● 1.4 Innovative Designer ○ b ● 1.6 Creative Communicator ○ a	<i>Students will understand that...</i> ● Video production is a powerful medium for storytelling, communication, and creativity. ● Effective editing techniques enhance the impact and clarity of a video project. ● After Effects allows for advanced visual effects, motion graphics, and post-production enhancements. ● A well-planned production process, including scripting, shooting, and editing, leads to professional-quality videos.	<i>Students will consider</i> ● What are some respectful strategies for communicating with team members during a stressful live production? ● What are the production responsibilities for each position in a live video production? ● What are elements of good composition and design when filming? ● How do you properly write a script and plan for a short film using shot lists and storyboards? ● How does video production influence communication and storytelling? ● What editing techniques are essential for producing professional-quality videos? ● How can motion graphics and visual effects enhance a video project? ● What are the key steps in planning and executing a successful video project?
Learning Targets		

Students will...

- Use Premiere Pro to edit video footage, apply transitions, and add effects.
- Use After Effects to create motion graphics and visual effects.
- Plan, shoot, and edit a video project that tells a clear and engaging story/idea.
- Apply color correction, audio enhancements, and visual effects to improve production quality.

Unit Duration:

6 weeks

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
1-4	AutoCAD	• Autodesk AutoCAD Software • Tutorials • Drawings provided by the teacher.	• Students will create and modify 2D technical drawings using fundamental AutoCAD tools. • Students will apply proper dimensioning, scaling, and layering to improve the clarity of my designs • Students will use commands such as trim, extend, fillet, and offset to refine and optimize my drawings. • Students will follow industry drafting standards to produce professional-quality technical drawings.	• AutoCAD tool skill exercise files. • Use AutoCAD to create a drawing of choice. • Use AutoCAD to create multiview drawing. • Label the AutoCAD interface and create a simple 2D shape using basic drawing tools. • Create a simple floor plan with labeled rooms, dimensions, and organized layers. • Design a fully dimensioned, multi-view mechanical drawing with layers and line types.
5-8	Inventor	• Autodesk Inventor Software • Drawings provided by the teacher using the Inventor tutorial program.	• Students will create and modify 3D models using parametric design techniques in Autodesk Inventor. • Students will apply geometric and dimensional constraints to maintain design accuracy. • Students will assemble multiple parts and ensure correct movement and alignment..	• Train tutorial. • Build a mechanical assembly with moving parts and generate fully detailed drawings. • Design a bracket with multiple extrusions and geometric constraints.

			Students will generate technical drawings and exploded views from a 3D model.	Create a simple extruded shape using the sketch and extrude tools.
9-12	Robotics	Lego Mindstorm VEX Robotics VEX Code - Tutorials	- Students will design, build, and program a functional robot according to specifications. - Write and modify code to program a robot for autonomous and driver-controlled tasks. - Use sensors to allow a robot to interact with its environment. - Systematically test, troubleshoot, and improve a robot's performance.	- Build a basic robot chassis using provided instructions. - Program a robot to drive in a square pattern using motor control. - Build and code a robot to follow a line or navigate obstacles using sensors. - Build a & Program Clawbot to complete motor and sensor challenges. - Build & Program original sumobot.
13-18	Video Productions	- Adobe Premiere Pro software - Adobe After Effects software - Google Docs/Slides - Video camera	- Students will brainstorm, write, film, and edit their own short film. - Students will use Premiere Pro to edit video footage, apply transitions, and add effects. - Students will use After Effects to create motion graphics and visual effects. - Students will plan, shoot, and edit a video project that tells a clear and engaging story/idea. - Students will apply color correction, audio enhancements, and visual effects to improve production quality.	- Create a sports hype video. - Create a music video. - Develop a cinematic short film or promotional video with professional-level editing. - Create a short commercial with smooth transitions, captions, and background music. - Assemble a short video sequence with properly arranged clips.

Proficiency Scales for Into to Digital Technology

Grade Level/Course: Intro to Digital Tech	Standard(s): ○ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ N ○ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ T, X ○ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ■ J ○ ITEEA Standard 7: Design in Technology and Engineering Education ■ Y Domain: AutoCAD 2D Design	○ ISTE 1.1 Empowered Learner ■ d ○ ISTE 1.4 Innovative Designer ■ b ○ ISTE 1.5 Computational Thinker ■ d ○ ISTE 1.6 Creative Communicator ■ a
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● AutoCAD tool skill exercise files. ● Use AutoCAD to create a drawing of choice.

3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Develops multi-view orthographic drawings using layers, scaling, and precise dimensioning. • Uses advanced tools to create accurate technical drawings following industry standards.	• Use AutoCAD to create multiview drawing. • Label the AutoCAD interface and create a simple 2D shape using basic drawing tools. • Create a simple floor plan with labeled rooms, dimensions, and organized layers. • Design a fully dimensioned, multi-view mechanical drawing with layers and line types.
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Uses fundamental modification tools (trim, extend, fillet, offset) to edit designs. • Applies basic layers and dimensions to organize and annotate drawings.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Identifies the tools to use as basic functions in 2D designs. • Identifies key AutoCAD tools and navigates the interface. • Creates basic geometric shapes using drawing tools.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Intro to Digital Tech	Standard(s): Inventor 3D Design ○ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ O ○ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ T, Y ○ ITEEA Standard 4: Impacts of Technology ■ P ○ ITEEA Standard 7: Design in Technology and Engineering Education ■ CC Domain: Inventor 3D Design	○ ISTE 1.1 Empowered Learner ■ d ○ ISTE 1.4 Innovative Designer ■ b ○ ISTE 1.5 Computational Thinker ■ d ○ ISTE 1.6 Creative Communicator ■ a
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Train tutorial. • Build a mechanical assembly with moving parts and generate fully detailed drawings.

3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. - Assembles multiple parts into a functional model, ensuring proper alignment and movement. - Creates technical drawings with detailed views and annotations.	- Design a bracket with multiple extrusions and geometric constraints. - Create a simple extruded shape using the sketch and extrude tools.
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. - Uses constraints and dimensions to maintain accuracy in part modeling. - Applies extrusions, revolves, and cuts to create functional 3D designs.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Navigates the Autodesk Inventor interface and uses basic tools to create simple 3D shapes. - Understands the concept of parametric modeling.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Intro to Digital Tech	Standard(s): - ITEEA Standard 1: Nature and Characteristics of Technology and Engineering - R - ITEEA Standard 2: Core Concepts of Technology and Engineering - V, Z - ITEEA Standard 4: Impacts of Technology - T - ITEEA Standard 7: Design in Technology and Engineering Education - BB Domain: Robotics	- ISTE 1.1 Empowered Learner - d - ISTE 1.4 Innovative Designer - b - ISTE 1.5 Computational Thinker - d - ISTE 1.7 Global Collaborator - c
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	Build a basic robot chassis using provided instructions.

3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Designs and programs a robot that integrates sensors for autonomous functions. • Troubleshoots and refines performance for improved efficiency.	• Program a robot to drive in a square pattern using motor control. • Build and code a robot to follow a line or navigate obstacles using sensors. • Build a & Program Clawbot to complete motor and sensor challenges. • Build & Program original sumobot.
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Builds a functional robot that moves and performs simple tasks. Writes basic programs to control motor movement and turning.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Assembles basic robotic components following instructions. • Identifies motors, sensors, and key mechanical parts.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Intro to Digital Tech	Standard(s): ○ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ Q ○ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ T ○ ITEEA Standard 7: Design in Technology and Engineering Education ■ AA Domain: Video Production	○ ISTE 1.1 Empowered Learner ■ d ○ ISTE 1.2 Digital Citizen ■ b ○ ISTE 1.4 Innovative Designer ■ b ○ ISTE 1.6 Creative Communicator ■ a
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Create a sports hype video. • Create a music video.

3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Produces a polished video project incorporating advanced editing techniques, color correction, and multi-layered effects. • Uses After Effects to add motion graphics.	• Develop a cinematic short film or promotional video with professional-level editing. • Create a short commercial with smooth transitions, captions, and background music. • Assemble a short video sequence with properly arranged clips.
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Edits videos with transitions, titles, and audio adjustments. • Uses keyframing and effects to enhance visual storytelling.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Navigates the Premiere Pro interface and imports video and audio assets. • Uses basic trimming tools to arrange clips in a sequence.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Home Repairs

Course Overview

Grade level(s): 9-12	Credits earned: ½ credit (semester course)
Course Description	
Home Repairs provides the basic information needed to understand and use hand tools, power tools, fasteners, and assorted building materials for the repair and maintenance of your future home. You will gain knowledge of the structure of a home and the skills and techniques used in carpentry, plumbing, electricity, and other building and landscaping trades. Proper maintenance of all housing systems will be stressed to prevent costly repairs and aesthetically pleasing homes. The lab fee covers a variety of materials for projects done in class.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses national standards for Industrial Technology) • Standard 1: Nature and Characteristics of Technology and Engineering ○ 1N - Explain how the world around them guides technological development and engineering design. ○ 1R - Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system. • Standard 2: Core Concepts of Technology and Engineering ○ 2W - Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste, while solving problems. ○ 2X - Cite examples of the criteria and constraints of a product or system and how they affect final design. ○ 2Y - Implement quality control as a planned process to ensure that a product, service, or system meets established criteria. • Standard 3: Integration of Knowledge, Technologies, and Practices	• Standard 4: Impacts of Technology ○ 4R - Assess a technology that minimizes resource use and resulting waste to achieve a goal. ○ 4S - Develop a solution to a technological problem that has the least negative environmental and social impact. • Standard 7: Design in Technology and Engineering Education ○ 7W - Determine the best approach by evaluating the purpose of the design. ○ 7X - Document trade-offs in the technology and engineering design process to produce the optimal design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7BB - Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process. ○ 7DD - Apply a broad range of making skills to their design process. • Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.

- 3J - Connect technological progress to the advancement of other areas of knowledge, and vice versa.

Unit 1: Safety *Desired Results*

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ● Standard 2: Core Concepts of Technology and Engineering ○ 2X, 2Y ● Standard 7: Design in Technology and Engineering Education ○ 7W, 7Y ● Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8P	<i>Students will understand that...</i> ● Safety is a foundational skill that ensures all home repair work is completed without harm. ● Proper use of tools and equipment prevents injuries and promotes efficient work. ● Personal Protective Equipment (PPE) is essential for safeguarding against common jobsite hazards. ● Following safety procedures builds responsibility and professionalism in the trades.	<i>Students will consider...</i> ● What are the benefits of doing your own home maintenance? ● How do you properly identify and use tools in basic maintenance? ● What are the safety rules that go with working safely in Home Repairs? ● Why is safety the most important aspect of home repair and construction? ● How do we choose and properly use the right safety equipment for each task? ● What are common jobsite hazards, and how can they be prevented? ● How does following safety protocols build trust and professionalism in a work environment?

Learning Targets

Students will...

- Demonstrate the importance of safety, how to use tools and equipment safely, and how to use the shop safely.

Unit Duration:

1-2 Weeks

Unit 2: Framing

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 3: Integration of Knowledge, Technologies, and Practices 3J - Standard 4: Impacts of Technology 4R, 4S - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P	<i>Students will understand that...</i> - Framing provides the structural foundation for walls, floors, and roofs in construction. - Accurate measurements and cuts are essential for strong and square framing. - Understanding framing layout is critical for future installation of systems like plumbing and electrical - Framing must meet building codes and structural requirements for safety and durability.	<i>Students will consider...</i> - What are framing members and how they go together to frame a structurally sound wall including rough openings for windows and doors? - How does framing support the overall structure of a home? - What tools and techniques are used to frame accurately and efficiently? - Why is understanding layout important before beginning a framing project? - How do building codes affect framing practices?
Learning Targets		
<i>Students will...</i> Construct a framed wall section.		
Unit Duration:		
1-2 Weeks		

Unit 3: Plumbing

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 3: Integration of Knowledge, Technologies, and Practices 3J - Standard 4: Impacts of Technology 4R, 4S - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P	<i>Students will understand that...</i> - Plumbing systems provide essential access to clean water and waste removal. - Understanding materials, connections, and flow is key to functional plumbing. - Proper planning and layout prevent future problems like leaks or blockages. - Plumbing work must comply with local codes and standards for safety and hygiene.	<i>Students will consider...</i> - How do you fit pvc and sweat copper? - What is the process of fitting PVC and Sweating copper? - How does water flow through a home, and what makes it efficient? - What tools and materials are used for basic plumbing tasks? - Why is proper layout and slope important in plumbing systems? - How can we prevent and troubleshoot common plumbing issues?
Learning Targets		
<i>Students will...</i> Build and put together PVC and Copper piping.		
Unit Duration:		
1-2 Weeks		

Unit 4: Electrical

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 3: Integration of Knowledge, Technologies, and Practices 3J - Standard 4: Impacts of Technology 4R, 4S - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P	<i>Students will understand that...</i> - Electrical systems are essential for powering modern homes safely and reliably. - Electrical work requires precise attention to detail and strict safety practices. - Understanding circuits, load, and grounding is key to effective wiring. - All electrical work must meet code to ensure safety and avoid fire hazards.	<i>Students will consider...</i> - What type of supplies and equipment are used in wiring a house for electricity? - How are houses wired for electricity? - How does electricity flow through a home, and how is it controlled? - What are the basic components of a residential electrical system? - How can we safely wire and test an electrical circuit? - Why are codes and regulations so important in electrical work?
Learning Targets		
<i>Students will...</i> Wire a single outlet, then add another outlet, a single pull switch, & 3-way switch.		
Unit Duration:		
1-2 Weeks		

Unit 5: Drywall with Mudding and Taping

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 3: Integration of Knowledge, Technologies, and Practices 3J - Standard 4: Impacts of Technology 4R, 4S - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P	<i>Students will understand that...</i> - Drywall creates a smooth, paintable surface and protects structural elements. - Taping and mudding techniques are used to hide seams and fasteners for a finished look. - Patience and precision are essential for a seamless drywall finish. - Repairing drywall is a valuable skill for maintaining the appearance of a home.	<i>Students will consider...</i> - How are interior walls finished? - What are the types and sizes of Drywall? - Why is drywall used in most modern homes? - How do taping and mudding improve the appearance and function of drywall? - What techniques help achieve a smooth and professional finish? - How can we repair damaged drywall effectively?
Learning Targets		
<i>Students will...</i> Apply drywall to their framed wall then they will tape and mud the joints.		
Unit Duration:		
1-2 Weeks		

Unit 6: Concrete

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 3: Integration of Knowledge, Technologies, and Practices 3J - Standard 4: Impacts of Technology 4R, 4S - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P	<i>Students will understand that...</i> - Concrete is a versatile and durable material used for structural and aesthetic purposes. - Proper mixing, forming, and curing affect the strength and longevity of concrete. - Tools and techniques influence the finish and quality of concrete work. - Safety and preparation are key in working with heavy materials like concrete.	<i>Students will consider...</i> - What are the components used to mix the concrete? - What is the process of forming and shaping concrete? - Why is it important to follow the proper steps in forming and shaping concrete? - What makes concrete such a commonly used material in construction? - How do we mix and pour concrete for a strong, long-lasting finish? - What tools and finishing techniques are used for quality concrete work? - Why is curing time important in the concrete process?
Learning Targets		
<i>Students will...</i> Mix and form concrete using tools and techniques designed for concrete construction		
Unit Duration:		
1-2 Weeks		

Unit 7: Tile Work and Finished Carpentry

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 3: Integration of Knowledge, Technologies, and Practices 3J - Standard 4: Impacts of Technology 4R, 4S - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P	<i>Students will understand that...</i> - Tile and finish carpentry add both function and aesthetic value to a home. - Precision and layout planning are essential in tile work and trim installation. - Materials, adhesives, and fasteners must be selected based on the environment and purpose. - High-quality finish work requires attention to detail and craftsmanship.	<i>Students will consider...</i> - What is the proper way to cut and layout tile? - What are the steps to forming and shaping boards to the proper size and length? - How are miter joints cut to create trim work? - What are the steps to finishing trim with stain and polyurethane? - How do tile and trim contribute to both function and style in a home? - What tools and techniques are essential for successful tile work and finish carpentry? - How do layout and planning influence the final outcome? - What makes finished work stand out as high quality?

Learning Targets

Students will...

- Create their own trim pieces for their tile project.
- Cut a base that will fit their tile.
- Cut their tile to fit within the dimensions of their base and trim pieces.

Unit Duration:

1-2 Weeks

Unit 8: Home Exterior

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2W - Standard 3: Integration of Knowledge, Technologies, and Practices 3J - Standard 4: Impacts of Technology 4R, 4S - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P	<i>Students will understand that...</i> - Exterior systems like siding, roofing, and gutters protect the home from weather and damage. - Proper installation and maintenance of exterior features extend the life of the home. - Curb appeal is influenced by materials, color, and craftsmanship. - Understanding drainage and water management is essential in exterior work.	<i>Students will consider...</i> - What aspects of the home exterior need maintenance? - How does landscaping and gardening have an effect on the home? - How do exterior components protect and preserve a home? - What factors should be considered when choosing exterior materials? - How can exterior maintenance prevent bigger problems inside the home? - What techniques help improve the appearance and function of a home's exterior?

Learning Targets

Students will...

- Identify various issues in home exterior maintenance.
- Demonstrate the process of growing a plant from a seed.

Unit Duration:

1-2 Weeks

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
1-2 and ongoing	Safety	- Teacher provided notes - Tutorials	Students will demonstrate mastery of safety in the shop (Tools, Equipment, Shop)	- Safety Test - Work with tools, machines, etc. on various projects - Demonstrate proper use of safeguards such as safety goggles, dust masks, ear plugs, and other Personal Safety Equipment while working on projects.
3-4	Framing	Teacher provided Blueprints & Demonstration for construction of framed wall	Students will be able to construct a framed wall section.	- Vocabulary/Identification test - Construction of a framed wall (scaled wall)
5-6	Plumbing	Teacher provided Blueprints & Demonstration for construction of plumbing	Students will be able to build and put together PVC and Copper piping.	- Solder copper pipe - Solvent weld PVC - Vocabulary/Identification test
6-7	Electrical	Teacher provided copies of circuit construction.	Students will be able to wire together the 4 different circuits (1 outlet, 2 outlets, single pull switch, & 3-way switch).	- Vocabulary/Identification test - Wiring project

Home Repairs

8-10	Drywall with Mudding & Taping	Teacher will demonstrate how to cut & assemble drywall. Then the teacher will demonstrate how to properly mud & tape the joints.	• Students will be able to cut & assemble the drywall. • Students will tape & mud the joints.	• Drywall with Mudding & Taping Test • Vocabulary/Identification test • Paint a wall • Install drywall • Mud and Tape a seam • Projects that are built to the specifications
11-12	Concrete & Home Exteriors/Gardening	Teacher will demonstrate how to mix concrete using construction tools.	• Students will be able to mix their own concrete and form it to the shape of the project of their choosing. • Students will use soil and potting tools to grow a plant from a seed.	• Vocabulary/Identification test • Stepping stones • Hypertufa pot
13-18	Tile Work & Finish Carpentry	• Detailed plans provided by the instructor • Demonstrations provided by instructor	• Students will be able to follow the plans given to them to complete a project. • Students will create their own trim pieces for their tile project. • Students will cut a base that will fit their tile. • Students will cut their tile to fit within the dimensions of their base and trim pieces.	• Vocabulary/Identification test • Mitre and route a border • Cut,install, and grout tile

Proficiency Scales for Home Repairs

Grade Level/Course: Home Repairs	Standard(s): ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ X, Y ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ W, Y ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ P Domain: Safety
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Safety test ● Work with tools, machines, etc. on various projects ● Demonstrate proper use of safeguards such as safety goggles, dust masks, ear plugs, and other Personal Safety Equipment while working on projects.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Demonstrate the proper use of safety while working in the shop, follow all safety procedures, and use all tools in the correct manner to prevent damage and/or injury. ● Follows expectations regarding specific tool, machines and general shop safety	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Recite or recall proper safety procedures	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify the tools, etc. in the shop	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Home Repairs	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ N, R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ W ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ○ J ■ ITEEA Standard 4: Impacts of Technology ○ R, S ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ W, X, Y, BB, CC, DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ P Domain: Framing
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Vocabulary/Identification test ● Construction of a framed wall (scaled wall)
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Demonstrate the ability to measure, cut, and construct a framed wall section.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Explain framing members and how they fit together to frame a structurally sound wall. ● Recalls specific terminology, such as: Stud, Bottom Plate, Top Plate, Header, Trimmer Stud, Cripple Stud, Rafter, Joist, Sub Floor, Truss	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify basic terminology such as wall, ceiling, floor, door, window	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Home Repairs	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ N, R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ W ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ○ J ■ ITEEA Standard 4: Impacts of Technology ○ R, S ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ W, X, Y, BB, CC, DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ P Domain: Plumbing
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	● Solder copper pipe ● Solvent weld PVC ● Vocabulary/Identification test
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. ● Properly construct waste and supply lines using the appropriate tools and techniques.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. ● Recall the steps on how to construct waste and supply lines ● Recalls specific terminology regarding plumbing ● Performs basic processes, such as: measuring and cutting pipe, preparing pipe	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. ● Differentiate between copper and pvc pipe ● Identify the tools associated with plumbing	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Home Repairs	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ N, R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ W ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ○ J ■ ITEEA Standard 4: Impacts of Technology ○ R, S ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ W, X, Y, BB, CC, DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ P Domain: Electrical
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Vocabulary/Identification test ● Wiring project
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Demonstrate how to wire 4 different circuits (single receptacle, multiple receptacles, single pole switch, 3-way switch).	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Recognizes or recalls specific terminology, such as: Volt, Amp, Ohms, Romex, 14/2, 12/2, Fixtures, Receptacles, etc. ● Performs basic processes, such as: Wiring basic receptacles	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify various types of supplies and equipment used for wiring houses for electricity.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Home Repairs	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ N, R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ W ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ○ J ■ ITEEA Standard 4: Impacts of Technology ○ R, S ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ W, X, Y, BB, CC, DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ P Domain: Wall Finishes
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	● Vocabulary/Identification test ● Paint a wall ● Install drywall ● Mud and Tape a seam
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. ● Demonstrate the ability to install and properly finish drywall	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. ● Measure, cut, and install drywall ● Properly paint a wall	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. ● Identify different types of drywall and joint compound ● Identify different sheens of paint	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Home Repairs	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ N, R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ W ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ○ J ■ ITEEA Standard 4: Impacts of Technology ○ R, S ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ W, X, Y, BB, CC, DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ P Domain: Concrete
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Vocabulary/Identification test ● Stepping stones ● Hypertufa pot
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Demonstrates how to properly form and mix concrete	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Identify the ratio of the concrete mixture	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify the components of the concrete mixture	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Home Repairs	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ N, R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ W ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ○ J ■ ITEEA Standard 4: Impacts of Technology ○ R, S ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ W, X, Y, BB, CC, DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ P Domain: Tile Work and Finished Carpentry
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Vocabulary/Identification test ● Mitre and route a border ● Cut,install, and grout tile
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Demonstrate tile work with a finished wood border	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Cut and install tile	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify the materials required for tile work	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Home Repairs	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ N, R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ W ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ○ J ■ ITEEA Standard 4: Impacts of Technology ○ R, S ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ W, X, Y, BB, CC, DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ P Domain: Home Exterior
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Aquaponics/Gardening project ● Residential gardening ● Exterior home project
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. Demonstrate the ability to cultivate an environment conducive for gardening Demonstrate proper techniques for exterior maintenance	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Demonstrate basic gardening practices ● Identify the purposes of home exterior components	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. Identify modern gardening techniques Identify home exterior components and maintenance	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Live Video Production Technology

Course Overview

Grade level(s): 9-12	Credits earned: 1 credit (full year course)
Course Description	
This exciting class allows students to work in a live production environment similar to that of Cardinals or Blues television production. Students use teamwork and problem-solving skills to set up and run live game productions. Students will plan, film, and edit team intro videos, player profiles, and other video board content. They also get to display their own creative content on the video board during games and assemblies.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses national standards for Industrial Technology) • Standard 2: Core Concepts of Technology and Engineering ○ 2Z - Use management processes in planning, organizing, and controlling work. • Standard 7: Design in Technology and Engineering Education ○ 7W - Determine the best approach by evaluating the purpose of the design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7AA - Illustrate principles, elements, and factors of design. ○ 7CC - Apply a broad range of design skills to their design process. • Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. ○ 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.	

Unit 1: Video Production Equipment Use and Care

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 2: Core Concepts of Technology and Engineering ■ 2Y, 2Z ■ Standard 7: Design in Technology and Engineering Education ■ 7Y ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8P	<i>Students will understand that...</i> ● Proper setup, use, and maintenance of video equipment are critical to professional-quality production. ● Understanding how equipment functions enables more creative and technical control during live productions. ● Equipment safety protocols protect both people and gear, ensuring long-term usability.	<i>Students will consider...</i> ● How do you safely set up, operate, and clean up live video production equipment? ● How does proper equipment care impact the quality and consistency of live video production? ● What are the functions and limitations of each piece of equipment in a live production setting? ● Why is safety and maintenance just as important as creative output?
Learning Targets		
<i>Students will...</i> ● Set up, adjust, and operate various tripods. ● Set up, adjust settings, operate and care for various cameras. ● Set up, use and monitor sound equipment. ● Set up and monitor a live stream. ● Operate and troubleshoot a video switcher. ● Identify and demonstrate proper use of video production tools, including cameras, tripods, microphones, and switchers. ● Apply safety procedures when handling and storing video equipment. ● Inspect, clean, and maintain gear to ensure it is production-ready		
Unit Duration:		
Week 1 & 2, then ongoing throughout the semester.		

Unit 2: Producing Video Board Content

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7Y, 7AA, 7CC	<i>Students will understand that...</i> ● Producing effective live content requires an understanding of timing, visual appeal, and audience engagement. ● Live video boards enhance the viewer experience when content is clear, relevant, and well-executed ● Content planning and real-time execution are equally important in a live setting.	<i>Students will consider...</i> ● Demonstrate the ability to cut audio and video while using effects and good pacing to develop video. ● What makes live video board content engaging and effective for audiences? ● How do timing and preparation affect the success of a live production? ● What are the steps involved in planning and executing a live segment?
Learning Targets		
<i>Students will...</i> ● Set up a new project in video editing and special effects software. ● Upload and organize video/audio assets. ● Cut and manipulate assets within video editing and special effects software. ● Add creative effects and transitions to projects where necessary. ● Export projects to a usable format. ● Storyboard or script content for live segments. ● Operate video board systems to produce and switch content live. ● Evaluate content for clarity, relevance, and visual impact.		
Unit Duration:		
Week 2 & 3 then ongoing throughout the semester.		

Unit 3: Teamwork and Communication in Live Production

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 2: Core Concepts of Technology and Engineering 2Z	<i>Students will understand that...</i> - Successful live production relies on collaboration, shared responsibility, and effective communication. - Clear roles and responsibilities contribute to a smooth production workflow. - Professionalism and teamwork under pressure are essential for live event success.	<i>Students will consider...</i> - What are some respectful strategies for communicating with team members during a stressful live production? - How does communication impact the success of a live production team? - What strategies help a production team stay coordinated under pressure? - Why is it important to understand and respect different production roles?
Learning Targets		
<i>Students will...</i> - Create and execute a program plan for a live production - Communicate necessary information within a live production environment. - Work together as a team to produce a comprehensive video product. - Demonstrate professional communication during live production rehearsals and events. - Collaborate with peers in defined production roles (e.g., director, camera operator, technical director). - Reflect on group dynamics and their contributions to team performance.		
Unit Duration:		
Ongoing throughout the semester.		

Unit 4: Problem Solving and Troubleshooting in Live Production

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7Y	<i>Students will understand that...</i> ● Technical issues are inevitable in live production and require quick, informed decision-making. ● Successful problem-solving depends on preparation, system knowledge, and adaptability. ● Troubleshooting is a skill that can be developed through practice and experience.	<i>Students will consider...</i> ● How would you troubleshoot and fix a technical problem during the course of a live production? ● What types of technical problems commonly occur during live production? ● How can preparation and system knowledge prevent or minimize disruptions? ● How do live production teams adapt when unexpected issues arise?
Learning Targets		
<i>Students will...</i> ● Troubleshoot and fix issues with the livestreaming process. ● Troubleshoot and fix issues with video signal loss. ● Troubleshoot and fix issues with audio loss. ● Identify common live production issues and propose potential solutions. ● Practice troubleshooting techniques during mock production scenarios. ● Develop a checklist to help prevent and respond to equipment or system errors.		
Unit Duration:		
Ongoing throughout the semester.		

Unit 5: Elements of Good Storytelling in Live Production

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 7: Design in Technology and Engineering Education ■ 7AA, 7CC	<i>Students will understand that...</i> ● Live production should communicate a clear message or narrative, even in short segments. ● Visual storytelling elements—like framing, pacing, and transitions—impact how messages are received. ● Storytelling in live video blends creativity with real-time decision-making.	<i>Students will consider...</i> ● What are the production responsibilities for each position in a live video production? ● What makes a live segment compelling and easy to follow? ● How can technical tools be used to enhance storytelling? ● How does storytelling differ in live production versus edited video?
Learning Targets		
<i>Students will...</i> ● Create and execute an intro sequence for live events. ● Use creative and appropriate camera angles to tell a story for live production. ● Use video and audio assets to enhance a live production. ● Analyze live broadcasts for effective storytelling elements. ● Plan and execute a live segment that conveys a clear narrative. ● Use video tools (e.g., graphics, transitions, audio) to enhance the message of a live production.		
Unit Duration:		
Ongoing throughout the semester.		

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
1-2	Equipment usage and care	Cameras, tripods, microphones, and lights.	Set up, adjust, operate and care for equipment appropriately.	Performance assessments on equipment set up, use, and clean up.
2-3 & ongoing	Producing interactive video board content	Video editing software, special effects software, cameras, tripods, microphones, lights and online production resources.	Use video editing and special effects software to produce comprehensive video projects.	Rubric assessments on the creation of player profiles, intro videos, crowd participation videos, pump motion graphics, etc.
Ongoing	Teamwork and communication in live Production	Computers, monitors, sound board, video switcher, cameras, tripods, microphones, lights.	Use teamwork and communication to produce a live video production.	Performance assessments on teamwork and communication during live productions.
Ongoing	Problem solving and troubleshooting in live Production	Computers, monitors, sound board, video switcher, cameras, tripods, microphones, lights.	Troubleshoot and fix problems that arise during a live production.	Performance assessments on troubleshooting and problem solving during live productions.
ongoing	Elements of good storytelling in live production	Computers, monitors, sound board, video switcher, cameras, tripods, microphones, lights.	Use video and audio assets to create a good comprehensive live production.	Performance assessments on using a variety of good camera shots at appropriate times, music, graphics, videos, and commentating during live productions.

Proficiency Scales for Live Video Production Technology

Grade Level/Course: Live Video Production Technology	Standard(s): ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2Y, 2Z ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ Y ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8P Domain: Video Production Equipment Use and Care
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	- Safely set up cameras on tripods and install batteries. - Connect cameras to video switcher. - Open and prepare the control room/box for a live production.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. The student will be able to: - Set up, adjust, and operate various tripods. - Set up, adjust settings, operate and care for various cameras. - Set up, use and monitor sound equipment. - Set up and monitor a live stream. - Operate and troubleshoot a video switcher. - Identify and demonstrate proper use of video production tools, including cameras, tripods, microphones, and switchers. - Apply safety procedures when handling and storing video equipment.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. - Use a quick release plate to attach cameras to tripods. - Use the power and record functions for various cameras. - Use a camera and tripod together the way it is designed to be used and with care for the equipment so nothing is broken or lost.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal.	

	Identify the tools needed (tripods, quick release plate, cameras, mics, boom poles, etc) to complete the task.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Live Video Production Technology	Standard(s): - ITEEA Standard 7: Design in Technology and Engineering Education - W, Y, AA, C Domain: Producing Video Board Content
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	- Use video editing and special effects software to create sport specific hype videos. - Use After Effects and/or Premier Pro to create crowd participation videos for in game situations.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. The student will be able to: - Set up a new project in video editing and special effects software. - Upload and organize video/audio assets. - Cut and manipulate assets within video editing and special effects software. - Add creative effects and transitions to projects where necessary. - Export projects to a usable format. - Storyboard or script content for live segments. - Operate video board systems to produce and switch content live. - Evaluate content for clarity, relevance, and visual impact.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. - Set up a new project in video editing and special effects software. - Upload and organize video/audio assets. - Cut and manipulate assets within video editing and special effects software. - Operate cameras in a live production setting	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal.	

	Choose appropriate software and production equipment to complete the task.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Live Video Production Technology	Standard(s): - ITEEA Standard 2: Core Concepts of Technology and Engineering - Z Domain: Teamwork and Communication in Live Production
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	Show director, tech director, replay tech and camera people will be observed and given feedback on their use of communication to coordinate and execute tasks within a live production.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. The student will be able to: - Communicate respectfully and using correct production language to produce a live event as part of a tech team - Communicate to troubleshoot tech problems - Communicate game action to a live audience - Demonstrate professional communication during live production rehearsals and events. - Students will collaborate with peers in defined production roles (e.g., director, camera operator, technical director). - Students will reflect on group dynamics and their contributions to team performance.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. Follow production instructions given by a director	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. Asks for help when needed to complete the task.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: Live Video Production Technology	Standard(s): ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ W, Y Domain: Problem Solving and Troubleshooting in Live Production
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	• Show director, tech director, replay tech and camera people use technical problem solving and troubleshooting skills to solve problems within a live production.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. The student will be able to: • Troubleshoot livestream issues • Troubleshoot image and audio issues • Troubleshoot schedule and set up issues • Identify common live production issues and propose potential solutions. • Practice troubleshooting techniques during mock production scenarios. • Develop a checklist to help prevent and respond to equipment or system errors.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. • Troubleshoot wiring and connection issues	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. • Identify the problem and ask someone for help to complete the task.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Live Video Production Technology	Standard(s): ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ AA, CCC Domain: Elements of Good Storytelling in Live Production
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	Performance assessment: Show director, tech director, replay tech, commentators and camera people complete individual tasks as part of a team to produce a cohesive live production.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. The student will be able to: - Direct a live production - Use video, audio, and graphics at appropriate times during a live production - Switch between cameras creatively and at appropriate times - Analyze live broadcasts for effective storytelling elements. - Plan and execute a live segment that conveys a clear narrative. - Use video tools (e.g., graphics, transitions, audio) to enhance the message of a live production.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. - Follow a script for a live production - Use appropriate camera angles for a given camera	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. Participate in live productions.	

LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Short Film Video Production Technology

Course Overview

Grade level(s): 9-12	Credits earned: .5 credit (semester course)
Course Description	
This exciting class allows students to be creative with video projects ranging from commercials to music videos to film festival-quality short films. Students are in charge of projects from concept to completion. They develop storylines, characters, and scripts as well as plan shots, and film, and edit video, audio, and effects.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses national standards for Industrial Technology) • Standard 1: Nature and Characteristics of Technology and Engineering ○ 1Q - Conduct research to inform intentional inventions and innovations that address specific needs and wants. ○ 1R - Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system. • Standard 2: Core Concepts of Technology and Engineering ○ 2Y - Implement quality control as a planned process to ensure that a product, service, or system meets established criteria. ○ 2Z - Use management processes in planning, organizing, and controlling work. • Standard 7: Design in Technology and Engineering Education ○ 7W - Determine the best approach by evaluating the purpose of the design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints.	○ 7BB - Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process. • Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. ○ 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality. ○ 8Q - Synthesize data and analyze trends to make decisions about technological products, systems, or processes.

- 7Z - Apply principles of human-centered design.
- 7AA - Illustrate principles, elements, and factors of design.

Unit 1: Video Production Equipment Use and Care

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 2: Core Concepts of Technology and Engineering ■ 2Y, 2Z ■ Standard 7: Design in Technology and Engineering Education ■ 7Y ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8P	<i>Students will understand that...</i> ● Proper setup, use, and care of video equipment are essential for producing high-quality film. ● Knowledge of equipment improves creative control and technical accuracy. ● Regular maintenance ensures safety and extends equipment lifespan.	<i>Students will consider...</i> ● How do you safely set up, operate, and clean up video production equipment? ● How does proper equipment use influence the final product? ● What safety measures are required when using video equipment? ● Why is routine maintenance critical in a production setting?

Learning Targets

Students will...

- Set up, adjust, and operate various tripods.
- Set up, adjust settings, operate and care for various cameras.
- Set up, use and monitor sound equipment.
- Set up and adjust lighting
- Identify and demonstrate safe and correct usage of video cameras, microphones, and lighting equipment.
- Perform routine maintenance and storage procedures.
- Apply safety protocols while using all equipment.

Unit Duration:

Week 1 & 2, then ongoing throughout the semester.

Unit 2: Elements of Good Composition & Design

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 7: Design in Technology and Engineering ■ 7AA, 7BB	<i>Students will understand that...</i> ● Composition and visual design affect how stories are perceived by audiences. ● Understanding visual principles enhances the emotional and narrative impact. ● Design choices must align with project goals and audience expectations.	<i>Students will consider...</i> ● What are elements of good composition and design when filming? ● What makes a visual Composition engaging and effective? ● How do design elements like framing, lighting, and color influence storytelling? ● How can design be used to enhance meaning?
Learning Targets		
<i>Students will...</i> ● Shoot video with meaningful angles and movements ● Shoot video using good elements of composition such as rule of thirds, color, contrast, lighting, leading lines, etc. ● Shoot video with purpose, using correct shots, angles and framing that convey the mood and story.		
Unit Duration:		
Week 2 & 3, then ongoing throughout the semester.		

Unit 3: Pre Production (Research & Planning)

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1Q, 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2Z	<i>Students will understand that...</i> ● Effective pre-production planning is critical to successful video production. ● Planning helps align resources, roles, and schedules to project goals.	<i>Students will consider...</i> ● How do you properly write a script and plan for a short film using shot lists and storyboards? ● How does Research enhance the quality and credibility of a short film? ● What are the key elements of a successful pre-production plan? ● Why is planning essential before filming begins?
Learning Targets		
<i>Students will...</i> ● Develop and plan a short film idea using input from research and classmates ● Further develop a short film idea within a small group ● Use teamwork to complete a script, storyboard, shotlist, and shooting schedule within a small group ● Conduct background research to support film topics. ● Develop scripts, shot lists, and production schedules. ● Organize production roles and responsibilities.		
Unit Duration:		
Ongoing throughout the semester.		

Unit 4: Production (Teamwork & Problem Solving)

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 7: Design in Technology and Engineering ■ 7Z ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8Q	<i>Students will understand that...</i> ● Collaborative teamwork is vital for a smooth and efficient production. ● Real-time problem solving and adaptability are essential during filming. ● Communication and coordination contribute to creative success.	<i>Students will consider...</i> ● What are the responsibilities of each member of the short film production team? ● What challenges arise during filming, and How can they be solved? ● How do team roles contribute to a successful production? ● What Communication strategies improve production outcomes?
Learning Targets		
<i>Students will...</i> ● Work in small groups using lighting equipment to properly light a short film set ● Work together to shoot sufficient, proper camera angles and movements to help tell a story ● Capture high quality audio during a shoot ● Collaborate effectively in assigned film production roles. ● Identify and solve problems that occur during filming. ● Practice Communication skills to maintain production flow.		
Unit Duration:		
Ongoing throughout the semester.		

Unit 5: Post Production (Putting It All Together)

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 7: Design in Technology and Engineering ■ 7CC ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8Q	<i>Students will understand that...</i> ● Editing transforms raw footage into a cohesive and compelling story. ● Post-production requires technical skills and aesthetic judgment. ● Effective Post-production enhances the clarity and impact of a film.	<i>Students will consider...</i> ● How do you use video editing and special effects software to create a professional looking short film? ● How does Editing shape the story told in a film? ● What tools and techniques are used in Post-production? ● How do visual and audio elements work together in the final product?

Learning Targets

Students will...

- Set up a new project in video editing and special effects software.
- Upload and organize video/audio assets.
- Cut and manipulate assets within video editing and special effects software.
- Add creative effects, transitions, color correction, music and sound effects to tell a creative story.
- Revise their films based on feedback to improve quality.
- Export projects to a usable format.

Unit Duration:

Ongoing throughout the semester.

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
1-2	Tech Equipment Use & Care	Cameras, tripods, microphones, and lights.	Set up, adjust, operate and care for equipment appropriately.	Performance assessments
2-3 & ongoing	Elements of Good Composition & Design	Cameras, tripods, microphones, lights.	Identify, plan for and apply elements of good composition and design.	Project assessments
Ongoing	Pre-Production (Research & Planning)	YouTube videos for research, and pre-production worksheets for planning.	Create scripts, storyboards and shot lists for a short film.	Written assessments
Ongoing	Production (Teamwork & Problem Solving)	Cameras, tripods, microphones, lights.	Use cameras, lights, and mics to shoot a short film.	Written assessments
Ongoing	Post Production (Putting It All Together)	Premier Pro, After Effects, online production resources.	Use Premiere Pro and After Effects to produce comprehensive video projects.	Project assessments

Proficiency Scales for Short Film Video Production Technology

Grade Level/Course: Short Film Video Production Technology	Standard(s): ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2Y, 2Z ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7Y ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8P Domain: Video Production Equipment Use and Care
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	- Set up, adjust, and operate various tripods. - Set up, adjust settings, operate and care for various cameras. - Set up, use and monitor sound equipment.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. The student will be able to: - Set up, adjust, and operate various tripods. - Set up, adjust settings, operate and care for various cameras. - Set up, use and monitor sound equipment. - Identify and demonstrate safe and correct usage of video cameras, microphones, and lighting equipment. - Perform routine maintenance and storage procedures. - Apply safety protocols while using all equipment.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. - Use a quick release plate to attach cameras to tripods. - Use the power and record functions for various cameras. - Use a camera and tripod together correctly.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal.	

	Identify cameras, tripods, microphones, etc. needed to complete the task.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Short Film Video Production Technology	Standard(s): - ITEEA Standard 7: Design in Technology and Engineering Education 7AA, 7BB Domain: Elements of Good Composition & Design
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	- Camera angle, movement and composition video. - Shoot and edit videos from various genres.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. The student will be able to: - Shoot video with meaningful angles and movements - Shoot video using good elements of composition such as rule of thirds, color, contrast, lighting, leading lines, etc. - Shoot video with purpose, using correct shots, angles and framing that convey the mood and story.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. - Shoot video with elements of good composition 50% of the time. - Shoot video with different camera angles and movements	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. - Identify the desired mood for a scene, and ask for help to achieve it. - Identify tools needed to complete the task.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Short Film Video Production Technology	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1Q, 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2Z Domain: Pre Production (Research & Planning)
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Preproduction research and brainstorming sheet. ● Shot list and storyboard sheet.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. The student will be able to: ● Complete a short film script ● Complete a detailed shot list ● Complete a storyboard ● Conduct background research to support film topics. ● Develop scripts, shot lists, and production schedules. ● Organize production roles and responsibilities.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Complete portions of a pre-production plan which includes a storyboard or video organizer.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify the shot list, script and storyboard.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: Short Film Video Production Technology	Standard(s): ■ ITEEA Standard 7: Design in Technology and Engineering ■ 7Z ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8Q Domain: Production (Teamwork & Problem Solving)
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Use cameras, tripods, lighting and sound equipment to shoot videos from various genres.
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. The student will be able to: • Participate in a video shoot in all of the following areas: ○ on screen talent ○ operate cameras, sound, and lighting on a shoot ○ direct a short film shoot • Collaborate effectively in assigned film production roles. • Identify and solve problems that occur during filming. • Practice Communication skills to maintain production flow.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. Students will collaborate and contribute in part of the video production process as: -on screen talent -operate cameras, sound, and lighting on a shoot -direct a short film shoot	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal.	

	Students can participate by doing what they are told to do in the production process.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: Short Film Video Production Technology	Standard(s): - ITEEA Standard 7: Design in Technology and Engineering Education 7CC - ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8Q Domain: Post Production (Putting It All Together)
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	Use video editing and special effects software to compile video, sound, and effects to complete videos from various genres.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. - Download and organize sound and video for editing. - Use advanced functions such as color grading, audio enhancement, etc. on video editing software to edit a professional looking short film. - Use special effects software to add lasers, portals, motion tracking and other visual effects to a short film. - Revise their films based on feedback to improve quality.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. Use basic functions adding video, adding audio, cutting video, adding titles, etc. on video editing software to edit a short film	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. Identify the correct software used to complete the task.	

LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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School Improvement Team

Course Overview

Grade level(s): 10-12**Credits earned:** .5 credit (semester course)**Prerequisite:** Woodworking & Material Processes or Home Repairs or Instructor approval**Course Description**

In this hands-on class, students will apply the skills acquired in the Home Repairs and Woodworking courses to undertake a variety of meaningful projects throughout the school. These projects will not only contribute to enhancing the school environment but also empower students to take ownership of their creations. Through collaboration with peers and meetings with school principals and various groups, students will engage in planning, designing, and executing projects that address real needs within the school. This experience will provide valuable opportunities to develop essential skills in problem-solving, communication, and project management, preparing students for future challenges in both academic and professional settings. Join us to make a tangible impact on your school community while gaining practical experience that extends beyond the classroom!

Transfer Goals

Students will be able to independently use their learning to...

- Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems.
- Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields.
- Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.

Priority Missouri Learning Standards/National Standards

[ITEEA Standards for Technological and Engineering Literacy](#) grades 9-12 (MO uses national standards for Industrial Technology)

- Standard 1: Nature and Characteristics of Technology and Engineering
 - 1Q - Conduct research to inform intentional inventions and innovations that address specific needs and wants.
 - 1R - Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system.
- Standard 2: Core Concepts of Technology and Engineering
 - 2T - Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.
 - 2V - Analyze the stability of a technological system and how it is influenced by all the components in the system, especially those in the feedback loop.
 - 2Y - Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.
 - 2Z - Use management processes in planning, organizing, and controlling work.
- Standard 3: Integration of Knowledge, Technologies, and Practices

- Standard 4: Impacts of Technology
 - 4P - Evaluate ways that technology can impact individuals, society, and the environment.
- Standard 7: Design in Technology and Engineering Education
 - 7W - Determine the best approach by evaluating the purpose of the design.
 - 7Z - Apply principles of human-centered design.
 - 7AA - Illustrate principles, elements, and factors of design.
 - 7BB - Implement the best possible solution to a design.
 - 7CC - Apply a broad range of design skills to their design process.
 - 7DD - Apply a broad range of making skills to their design process.
- Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems
 - 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
 - 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.

- 3J - Connect technological progress to the advancement of other areas of knowledge, and vice versa.

- 8Q - Synthesize data and analyze trends to make decisions about technological products, systems, or processes.

Unit 1: Safety

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 2: Core Concepts of Technology and Engineering ■ 2Y, 2Z ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8P	<i>Students will understand that...</i> ● A safe working environment requires consistent awareness and adherence to procedures. ● Proper use of tools and equipment protects individuals and ensures the longevity of resources. ● Knowledge of safety protocols empowers students to take responsibility for themselves and others.	<i>Students will consider...</i> ● Why is it important to know and follow proper safety procedures? ● What are the proper safety procedures for working in an industrial environment? ● What are the safety rules for the use of hand and power tools? ● Why is safety a critical part of any construction or repair project? ● How does following safety protocols impact the success of a project? ● What responsibilities do individuals have to ensure a safe workspace?
Learning Targets		
<i>Students will...</i> ● Know and demonstrate the proper ways to use tools safely in the shop and throughout the building while working on projects. ● Will be able to demonstrate the proper use of safety while working in the shop, follows all safety procedures, and uses all tools in the correct manner to prevent damage and/or injury. ● Follows expectations regarding specific tool, machines and general shop safety		
Unit Duration:		
3 weeks		

Unit 2: Client Communication

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 3: Integration of Knowledge, Technologies, and Practices ■ 3J ■ Standard 4: Impacts of Technology ■ 4P ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7Z	<i>Students will understand that...</i> ● Effective communication helps clarify project goals and builds trust with stakeholders. ● Listening actively to client needs leads to better project outcomes. ● Professional communication skills are essential for both school and future workplace success.	<i>Students will consider...</i> ● What are the needs of the client? ● What are the client and project parameters? ● What is the timeline of the project? ● How do we determine what a client truly needs and wants? ● What communication strategies help maintain a positive client relationship? ● Why is clarity important when discussing project ideas and limitations?
Learning Targets		
<i>Students will...</i> ● Develop the skills necessary to effectively communicate with clients, understanding their needs and expectations to create a project that aligns with their vision. ● Complete a client survey, which includes vision of the project based on the clients needs. ● Identify potential hazards and take steps to prevent accidents.		
Unit Duration:		
1-2 weeks		

Unit 3: Design

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1Q, 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T ■ Standard 7: Design in Technology and Engineering Education ■ 7AA, 7BB, 7CC	<i>Students will understand that...</i> ● Design is a creative and technical process that transforms ideas into workable plans. ● Good design takes into account function, materials, aesthetics, and client needs. ● Collaboration in the design process leads to stronger and more thoughtful outcomes.	<i>Students will consider...</i> ● Why is accuracy important when measuring? ● Why is it important to follow a universal template when designing plans? ● What are the tools used for layout and measuring? ● How do you properly fill out a bill of materials? ● "What are the tools used for layout and measuring?" ● What makes a design both functional and visually appealing? ● How do we translate a client's needs into an effective design? ● What role does collaboration play in improving design solutions?
Learning Targets		
<i>Students will...</i> ● Demonstrate understanding of the proper tools for layout and measuring and utilize these tools to properly layout projects in preparation of the build. ● Demonstrate understanding of what a bill of materials is and be able to properly complete a bill of materials. ● Creates design sketches or models that reflect client goals. ● Selects materials and methods appropriate for the project. ● Revises designs based on feedback and feasibility.		
Unit Duration:		

1-2 Weeks

Unit 4: Project Build***Desired Results***

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 2: Core Concepts of Technology and Engineering 2V - Standard 7: Design in Technology and Engineering Education 7BB, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8Q, 8P	<i>Students will understand that...</i> - Construction requires precision, planning, and collaboration to execute effectively. - Hands-on building brings design concepts to life and reinforces technical skills. - Ownership and pride in one's work come from meaningful contributions to real-world projects.	<i>Students will consider...</i> - Why is it important to select the appropriate tools? - What are the basic techniques used in power sawing? - What are the basic techniques used in forming and shaping? - How do you properly use the various tools in the class and what are they used for? - Why is it important to know the differences between assembly joints? - What components are used in the assembly process? - What are the basic techniques used in assembly? - Why is it important to follow a universal template when designing plans? - What components are used in the finishing process? - How does the build phase bring our design to life? - What makes a construction process efficient and accurate? - Why is it important to take pride in the quality of one's work?
Learning Targets		
<i>Students will...</i> - Demonstrate understanding of the proper tools for sawing, forming and shaping. - Utilize various tools to create a variety of project - Use various assembly and finishing techniques in the completion of a project.		
Unit Duration:		

1 week - 5 weeks

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
Week 1-3	Safety	Home Repairs & Maintenance	Students will know and demonstrate the proper ways to use tools safely in the shop.	Safety Test
Week 1-2	Client Communication	Client Questions	Students will develop the skills necessary to effectively communicate with clients, understanding their needs and expectations to create a project that aligns with their vision.	Client Survey
Week 4-5	Planning & Layout	Bill of Materials Data Sheet	Students will know the proper tools for layout and measuring. They will be able to utilize these tools to properly layout projects in preparation of the build.	Completed Bill of Materials Projects built to accurate dimensions

Week 5-18	Tool Skills, Joinery Skills, Finish Skills	Tool Demonstrations Video Demonstrations	Students will know what a bill of materials is and being able to properly complete a bill of materials. Students will know the proper tools for sawing, forming and shaping. Students will be able to utilize various tools to create a variety of projects. Students will be able to use various assembly and finishing techniques in the completion of a project.	Completed Projects Final Exam
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Proficiency Scales for School Improvement Team

Grade Level/Course: School Improvement Team	Standard(s): ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2Y, 2Z ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8P Domain: Safety
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Safety test ● Work with tools, machines, etc. on various projects ● Demonstrate proper use of safeguards such as safety goggles, dust masks, ear plugs, and other Personal Safety Equipment while working on projects.
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed.	

	• Demonstrates the proper use of safety while working in the shop, follows all safety procedures, and uses all tools in the correct manner to prevent damage and/or injury. • Follows expectations regarding specific tool, machines and general shop safety • Identify potential hazards and take steps to prevent accidents.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Can recite or recall proper safety procedures	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Can identify the tools, etc. in the shop	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: School Improvement Team	Standard(s): ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ■ 3J ■ ITEEA Standard 4: Impacts of Technology ■ 4P ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7W, 7Z Domain: Client Communication
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Completed Client Survey
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Complete a client survey, which includes vision of the project based on the clients needs. • Use active listening skills to understand client needs.	

	- Communicate project ideas clearly and respectfully. - Maintain a professional tone in written and verbal communications. - Communicates clearly and professionally, fully addressing client needs and concerns.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. - Complete a client survey by communicating with the client and stakeholders to gain important project information. - Shares ideas clearly and asks questions to clarify client expectations.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Recognizes what goes into a client survey. - Demonstrates respectful communication and listens attentively in project discussions.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: School Improvement Team	Standard(s): - ITEEA Standard 1: Nature and Characteristics of Technology and Engineering 1Q, 1R - ITEEA Standard 2: Core Concepts of Technology and Engineering 2T - ITEEA Standard 7: Design in Technology and Engineering Education 7AA, 7BB, 7CC Domain: Design
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Complete a Bill of Materials - Knowledge of terminology
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. Completes a bill of materials, which includes a cutting diagram, stock cutting list, and material cost list.	

	- Creates design sketches or models that reflect client goals. - Selects materials and methods appropriate for the project. - Revises designs based on feedback and feasibility.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. - Can Differentiate between: - stock cutting list, material cost list, cutting diagram - Creates a design that includes key components and shows understanding of project goals.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Recognizes or recalls specific terminology, such as: - stock cutting list, material cost list, cutting diagrama - Generates design ideas based on client input and selects basic materials for planning.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: School Improvement Team	Standard(s): - ITEEA Standard 2: Core Concepts of Technology and Engineering 2V - ITEEA Standard 7: Design in Technology and Engineering Education 7BB, 7DD - ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8Q, 8P Domain: Project Build
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	A completed project. Examples would be shelving, mudding drywall, painting, landscaping etc...
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. Uses a variety of techniques in order to glue, clamp and assemble projects together.	

	• Accurately measures, cuts, and assembles materials according to plans. • Works collaboratively to complete projects within the timeline. • Evaluates the quality and effectiveness of the final product.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Can differentiate between a butt joint and rabbet joint • Uses appropriate tools to complete project tasks and follows project steps.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Recognizes or recalls specific terminology, such as: ○ Glue Joints, fasteners, and clamping • Follows build instructions and safely completes entry-level construction tasks.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

PLTW Introduction to Engineering Design

Course Overview

Grade level(s): 9-12

Credits earned: 1 credit (full year course)

Course Description

Students will dig deep into the engineering design process, applying math, science, and engineering standards to hands-on projects like designing a new toy or improving on an existing product. They will work both individually and in teams to design solutions to a variety of problems using 3-D modeling software and use an engineering notebook to document their work. This is the introductory Project Lead the Way (PLTW) course in the Engineering pathway.

Transfer Goals/Big Ideas

Students will be able to independently use their learning to...

- Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems.
- Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields.
- Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.

Priority Missouri Learning Standards/National Standards

[ITEEA Standards for Technological and Engineering Literacy](#) grades 9-12 (MO uses national standards for Industrial Technology)

- **Standard 1: Nature and Characteristics of Technology and Engineering**
 - 1O - Assess how similarities and differences among scientific, mathematical, engineering, and technological knowledge and skills contributed to the design of a product or system
 - 1Q - Conduct research to inform intentional inventions and innovations that address specific needs and wants.
 - 1R - Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system.
- **Standard 2: Core Concepts of Technology and Engineering**
 - 2T - Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.
 - 2W - Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste, while solving problems
 - 2Y - Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.
- **Standard 7: Design in Technology and Engineering Education**
 - 7Z - Apply principles of human-centered design.
 - 7AA - Illustrate principles, elements, and factors of design.
 - 7BB - Implement the best possible solution to a design.
 - 7CC - Apply a broad range of design skills to their design process.
- **Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems**
 - 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
 - 8Q - Synthesize data and analyze trends to make decisions about technological products, systems, or processes.

- 7W - Determine the best approach by evaluating the purpose of the design.
- 7Y - Optimize a design by addressing desired qualities within criteria and constraints.

Unit 1: Design Process

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1Q, 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7Y, 7Z	<i>Students will understand that...</i> ● The engineering design process is an iterative, systematic approach to problem solving. ● Engineering design is a systematic process used to solve complex problems. ● The design process involves iteration, feedback, and collaboration. ● Understanding user needs is essential to developing effective solutions.	<i>Students will consider...</i> ● What are the major steps of a design process and identify typical tasks involved in each step? ● How do you document a design process in an engineering notebook according to best practices? ● What are the steps of the engineering design process? ● Why is iteration an important part of the design process? ● How can understanding the problem lead to better solutions?
Learning Targets		
<i>Students will...</i> ● Describe major steps of a design process and identify typical tasks involved in each step. ● Document a design process in an engineering notebook according to best practices. ● Represent concepts using a variety of visual tools, such as sketches, graphs, and charts, to communicate details of an idea.		
Unit Duration:		
Ongoing throughout the year		

Unit 2: Technical Sketching

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 10 ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T ■ Standard 7: Design in Technology and Engineering Education ■ 7AA, 7CC	<i>Students will understand that...</i> ● Technical sketching is a visual language used to communicate design ideas. ● Different types of sketches serve unique purposes in the design process. ● Sketching helps visualize and refine design concepts before modeling.	<i>Students will consider...</i> ● How is technical drawing similar to and different from artistic drawing? ● In what ways can technical drawings help or hinder the communication of problem solutions in a global community? ● Strong spatial-visualization skills have been linked to success in engineering. ● Why are spatial visualization skills so important to engineering success? ● Why is sketching an important skill for engineers? ● What types of sketches are used in different stages of design? ● How does sketching help in the development of ideas?
Learning Targets		
<i>Students will...</i> ● Choose and justify the choice for the best orthographic projection of an object to use as a front view on technical drawings. ● Determine the minimum number and types of views necessary to fully detail a part. Identify line types used in technical drawing and the purpose and interpretation of each, including construction lines, object lines, hidden lines, and center lines. ● Identify and describe the proper use of each technical drawing representation, including isometric, orthographic, oblique, section, and auxiliary views.		
Unit Duration:		
5 Weeks		

Unit 3: Measurement Statistics

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 10 ■ Standard 2: Core Concepts of Technology and Engineering ■ 2W, 2Y ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8Q	<i>Students will understand that...</i> ● Precise measurement is essential to producing accurate and functional designs. ● Statistical analysis helps interpret data and identify sources of error. ● Measurement and data support decision-making throughout the design process.	<i>Students will consider...</i> ● Can statistics be interpreted to justify conflicting viewpoints? ● Can this affect how we use statistics to inform, justify, and validate a problem solution? ● Why is error unavoidable when making a measurement? ● What strategy would you use to teach another student how to use units and quantitative reasoning to solve a problem involving quantities? ● What would happen if engineers did not follow accepted dimensioning standards and guidelines but, instead, used their own individual dimensioning methods? ● Why is precision important in engineering measurements? ● How can statistics help identify problems in a design? ● How do engineers use measurement and data to improve designs?

Learning Targets

Students will...

- Explain that all measurements are an approximation of the true value of a quantity. Explain and differentiate between the accuracy and precision of a measurement or measuring device.
- Use dimensional analysis and unit conversions to transform data to consistent units or to units appropriate for a particular purpose or model.
- Populate a spreadsheet application with data and organize the data to be useful in accomplishing a specific goal.
- Use the functions and tools within a spreadsheet application to manipulate, analyze, and present data in a useful way, including regression analyses and descriptive statistical analyses.

Unit Duration:
4 Weeks

Unit 4: Modeling Skills <i>Desired Results</i>		
Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 2: Core Concepts of Technology and Engineering 2T - Standard 7: Design in Technology and Engineering Education 7BB, 7CC - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8Q	<i>Students will understand that...</i> 3D modeling allows engineers to visualize, test, and refine designs. - Digital modeling facilitates design accuracy, efficiency, and collaboration. - Computer-aided design (CAD) tools are essential in modern engineering practices.	<i>Students will consider...</i> - How should one decide what information and/or artifacts to include in a portfolio? - Should a portfolio always include documentation on the complete design process? - Why do engineers use models? How reliable is a model? - How do engineers use CAD software to develop designs? - What are the benefits of using digital models in engineering? - How can modeling identify and solve design challenges before building?
Learning Targets		
<i>Students will...</i> - Represent data for two quantitative variables on a scatter plot, and describe how the variables are related. - Fit a function to the data; use linear functions fitted to data to solve problems in the context of the data. In linear models, interpret the rate of change (slope) and the intercept (constant term) in the context of the data. - Develop a graphical model (function) that describes a relationship between two quantities given a description of a relationship (e.g. motion graph) - Identify and differentiate geometric constructions and constraints (such as horizontal lines, vertical lines, parallel lines, perpendicular lines, collinear points, tangent lines, tangent circles, and concentric circles) and the results, when applied to sketch features within a 3D solid modeling environment. - Differentiate between additive and subtractive 3D modeling techniques. - Compare the efficiency of creating a 3D computer model using different combinations of additive and subtractive modeling techniques. - Apply geometric and dimensional constraints within a CAD program to model an object.		

Unit Duration:
12 weeks

Unit 5: Documentation <i>Desired Results</i>		
Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1R ■ Standard 7: Design in Technology and Engineering Education ■ 7Z ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8Q	<i>Students will understand that...</i> ● Engineering documentation ensures repeatability, communication, and legal protection. ● Clear and accurate records help track design decisions and iterations. ● Professional documentation is a critical part of the engineering workflow.	<i>Students will consider...</i> ● What quality makes a set of drawings sufficient to adequately represent the design intent? ● Is it always necessary to indicate a tolerance for every dimension on a technical drawing and why do you think that? ● Why is documentation important in engineering design? ● What types of documents are used in different phases of a project? ● How does documentation support collaboration and improvement?
Learning Targets		
<i>Students will...</i> ● Identify the step in which an engineering task would fit in a design process. ● Outline how iterative processes inform engineering decisions, improve solutions, and inspire new ideas. ● Explain the importance of carefully and specifically defining a problem or opportunity, design criteria, and constraints, to develop successful design solutions. ● Identify and define visual, functional, and structural design requirements with realistic constraints, against which solution alternatives can be evaluated.		

- List potential constraints that may impact the success of a design solution. Examples include economic (cost), environmental, social, political, ethical, health and safety, manufacturability, technical feasibility, and sustainability. Explain that a conclusion is valid if the evidence supports the conclusion while acknowledging the limitations, opposing views, and biases.
- Evaluate evidence and arguments to identify deficiencies, limitations, and biases or appropriate next steps in the pursuit of a better solution.

Unit Duration:

Ongoing throughout the year

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
Design-Ongoing throughout the year	Engineering Design Process	PLTW Student Resources • Units 1,2,3,4	• Describe major steps of a design process and identify typical tasks involved in each step. • Document a design process in an engineering notebook according to best practices. • Represent concepts using a variety of visual tools, such as sketches, graphs, and charts, to communicate details of an idea.	Teacher will evaluate the documentation of the design process in the engineering notebook.
5 Weeks/Ongoing	Technical Sketching	PLTW Student Resources • Units 1,2,3,4	• Choose and justify the choice for the best orthographic projection of an object to use as a front view on technical drawings. • Determine the minimum number and types of views necessary to fully detail a part. Identify line types used in technical drawing and the purpose and interpretation of each, including construction lines, object lines, hidden lines, and center lines. • Identify and describe the proper use of each technical drawing representation, including isometric, orthographic, oblique, section, and auxiliary views.	Teacher will assess drawings created by students. Quizzes and Tests

8 Weeks/ Ongoing	Statistics	PLTW Student Resources Units 2,3,4	- Explain that all measurements are an approximation of the true value of a quantity. Explain and differentiate between the accuracy and precision of a measurement or measuring device. - Use dimensional analysis and unit conversions to transform data to consistent units or to units appropriate for a particular purpose or model. - Populate a spreadsheet application with data and organize the data to be useful in accomplishing a specific goal. - Use the functions and tools within a spreadsheet application to manipulate, analyze, and present data in a useful way, including regression analyses and descriptive statistical analyses.	Projects, Quizzes and Tests Teacher will assess drawings created by students.
12 Weeks/ Ongoing	Modeling	PLTW Student Resources Units 1,2,3,4	- Represent data for two quantitative variables on a scatter plot, and describe how the variables are related. - Fit a function to the data; use linear functions fitted to data to solve problems in the context of the data. In linear models, interpret the rate of change (slope) and the intercept (constant term) in the context of the data. - Develop a graphical model (function) that describes a relationship between two quantities given a description of a relationship (e.g. motion graph) - Identify and differentiate geometric constructions and constraints (such as horizontal lines, vertical lines, parallel lines, perpendicular lines, collinear points, tangent lines, tangent circles, and concentric circles) and the results, when applied to sketch features within a 3D solid modeling environment. - Differentiate between additive and subtractive 3D modeling techniques. - Compare the efficiency of creating a 3D computer model using different combinations	Quizzes and Tests

			of additive and subtractive modeling techniques. • Apply geometric and dimensional constraints within a CAD program to model an object.	
Ongoing	Documentation	PLTW Student Resources • Units 1,2,3,4	• Identify the step in which an engineering task would fit in a design process. • Outline how iterative processes inform engineering decisions, improve solutions, and inspire new ideas. • Explain the importance of carefully and specifically defining a problem or opportunity, design criteria, and constraints, to develop successful design solutions. • Identify and define visual, functional, and structural design requirements with realistic constraints, against which solution alternatives can be evaluated. • List potential constraints that may impact the success of a design solution. Examples include economic (cost), environmental, social, political, ethical, health and safety, manufacturability, technical feasibility, and sustainability. Explain that a conclusion is valid if the evidence supports the conclusion while acknowledging the limitations, opposing views, and biases. • Evaluate evidence and arguments to identify deficiencies, limitations, and biases or appropriate next steps in the pursuit of a better solution.	Teacher will evaluate the documentation of the design process in the engineering notebook.

Proficiency Scales for PLTW Introduction to Engineering Design

Grade Level/Course: PLTW Introduction to Engineering Design	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1Q, 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7Y, 7Z Domain: Design Process
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	● Engineering Notebook Entries ● Brainstorming Activities ● Write a Design Brief ● Design Challenges
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed.	

Grade Level/Course: PLTW Introduction to Engineering Design	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1O ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T ■ Standard 7: Design in Technology and Engineering Education ■ 7AA, 7CC Domain: Technical Sketching
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	● Line type Practice ● Line Conventions Practice ● Isometric Drawing Activities ● Multi view Drawing Activities ● Engineering Notebook Entries
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. ● Sketch an Isometric drawing, Multiview Drawings, and Perspective Drawing while using the correct line types.	

	- Choose and justify the choice for the best orthographic projection of an object to use as a front view on technical drawings. - Determine the minimum number and types of views necessary to fully detail a part. Identify line types used in technical drawing and the purpose and interpretation of each, including construction lines, object lines, hidden lines, and center lines. - Identify and describe the proper use of each technical drawing representation, including isometric, orthographic, oblique, section, and auxiliary views.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. Identify various technical sketches and line types.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. Identify names of the different line types and technical drawings.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Introduction to Engineering Design	Standard(s): - ITEEA Standard 1: Nature and Characteristics of Technology and Engineering 10 - ITEEA Standard 2: Core Concepts of Technology and Engineering 2W, 2Y - ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8Q Domain: Measurement Statistics
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Ruler Games - Measurement Activities - Dimensioning Practice - Engineering Notebook Entries
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. Represent data for two quantitative variables on a scatter plot, and describe how the variables are related.	

	- Fit a function to the data; use linear functions fitted to data to solve problems in the context of the data. In linear models, interpret the rate of change (slope) and the intercept (constant term) in the context of the data. - Develop a graphical model (function) that describes a relationship between two quantities given a description of a relationship (e.g. motion graph). - Identify and differentiate geometric constructions and constraints (such as horizontal lines, vertical lines, parallel lines, perpendicular lines, collinear points, tangent lines, tangent circles, and concentric circles) and the results, when applied to sketch features within a 3D solid modeling environment. - Compare the efficiency of creating a 3D computer model using different combinations of additive and subtractive modeling techniques. - Apply geometric and dimensional constraints within a CAD program to model an object.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. Measure using both Metric and US Customary Systems accurately and dimension basic drawings	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. Accurately using one of the two measurement systems and and dimension basic drawings	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Introduction to Engineering Design	Standard(s): - ITEEA Standard 2: Core Concepts of Technology and Engineering 2T - ITEEA Standard 7: Design in Technology and Engineering Education 7BB, 7CC - ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8Q Domain: Modeling Skills
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Puzzle Cube Project - Reverse Engineering Project - Automata Project - Engineering Notebook Entries
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. Create 3D drawings on the modeling software using all 4 types of files.	

	• Represent data for two quantitative variables on a scatter plot, and describe how the variables are related. • Fit a function to the data; use linear functions fitted to data to solve problems in the context of the data. In linear models, interpret the rate of change (slope) and the intercept (constant term) in the context of the data. • Develop a graphical model (function) that describes a relationship between two quantities given a description of a relationship (e.g. motion graph) • Identify and differentiate geometric constructions and constraints (such as horizontal lines, vertical lines, parallel lines, perpendicular lines, collinear points, tangent lines, tangent circles, and concentric circles) and the results, when applied to sketch features within a 3D solid modeling environment. • Compare the efficiency of creating a 3D computer model using different combinations of additive and subtractive modeling techniques. • Apply geometric and dimensional constraints within a CAD program to model an object.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Create 3D drawings on the modeling software and assemble them in a different file. • Differentiate between additive and subtractive 3D modeling techniques.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Create a Basic 3D drawing on the 3D modeling software using only sketch and extrude.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

PLTW Civil Engineering and Architecture

Course Overview

Grade level(s): 9-12	Credits earned: 1 credit (full year course)
Course Description	
Students learn important aspects of building and site design and development. They apply math, science, and standard engineering practices to design both residential and commercial projects and document their work using 3-D architectural design software.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses national standards for Industrial Technology) • Standard 1: Nature and Characteristics of Technology and Engineering ○ 1O - Assess how similarities and differences among scientific, mathematical, engineering, and technological knowledge and skills contributed to the design of a product or system ○ 1Q - Conduct research to inform intentional inventions and innovations that address specific needs and wants. ○ 1R - Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system. • Standard 2: Core Concepts of Technology and Engineering ○ 2T - Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making. ○ 2W - Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste, while solving problems. ○ 2X - Cite examples of the criteria and constraints of a product or system and how they affect final design. ○ 2Z - Use management processes in planning, organizing, and controlling work.	• Standard 4: ○ 4P - Evaluate ways that technology can impact individuals, society, and the environment. ○ 4Q - Critique whether existing and proposed technologies use resources sustainably. • Standard 5: ○ 5J - Design an appropriate technology for use in a different culture. • Standard 6: ○ 6H - Evaluate how technology has been a powerful force in reshaping social, cultural, political, and economic, and landscapes throughout history. • Standard 7: ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7Z - Apply principles of human-centered design. ○ 7AA - Illustrate principles, elements, and factors of design. ○ 7BB - Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process. ○ 7DD - Apply a broad range of making skills to their design process. • Standard 8: ○ 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. ○ 8O - Develop a device or system for the marketplace. ○ 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.

Unit 1: Overview of Civil Engineering and Architecture

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T ■ Standard 5: Influence of Society on Technological Development ■ 5J ■ Standard 6: History of Technology ■ 6H ■ Standard 7: Design in Technology and Engineering Education ■ 7AA, 7CC	<i>Students will understand that...</i> ● An engineering design process is an iterative, systematic approach to problem solving. ● Civil engineering and architecture shape the built environment and influence how people live and interact. ● The fields of civil engineering and architecture are distinct but interconnected, requiring collaboration. ● Historical and modern innovations in these fields respond to human needs and societal challenges.	<i>Students will consider:</i> ● What is Civil Engineering, and items a civil engineer may do? ● What is Architecture, and items an architect may do? ● What are the Principles and Elements of Design? ● What Accreditation Firms make sure that colleges are holding to proper standards (Both Civil and Architectural)? ● What is a Stakeholder? ● How do civil engineers and architects contribute to the design of the built environment? ● What are the major responsibilities and areas of overlap between civil engineering and architecture? ● How have innovations in civil engineering and architecture impacted society?
Learning Targets		
<i>Students will...</i> ● Identify the difference between engineering and architecture. ● Identify engineering and architecture careers and the pathways to reach those careers. ● Identify and give an example of architecture principles, elements, styles, and features ● Comprehend and develop a design charrette using stakeholder point of views. ● Explain the roles, responsibilities, and contributions of civil engineers and architects.		
Unit Duration:		
3-4 Weeks		

Unit 2: Residential Design

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 10, 1R - Standard 2: Core Concepts of Technology and Engineering 2T, 2X, 2Z - Standard 5: Influence of Society on Technological Development 5J - Standard 7: Design in Technology and Engineering Education 7AA, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N	<i>Students will understand that...</i> - Residential design must balance function, aesthetics, sustainability, and client needs. - Zoning, codes, and local regulations play a critical role in shaping residential architecture. - Site planning and layout impact the livability, efficiency, and safety of a residential structure.	<i>Students will consider...</i> - What are the subsystems of residential design? - What residential codes need to be followed. - Why is it important to estimate the cost of construction for a building project? - What factors influence the design of a residential structure? - How do building codes and zoning regulations affect residential projects? - Why is site selection and layout important in the design process?

Learning Targets

Students will...

- Identify components of a residential building.
- Design a residential building using CAD that meets functional, aesthetic, and regulatory requirements.
- Create a set of plans and presentation documents.

Unit Duration:

10-12 Weeks

Unit 3: Commercial Applications

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1O, 1Q, 1R - Standard 2: Core Concepts of Technology and Engineering 2T, 2X - Standard 7: Design in Technology and Engineering Education 7Y, 7Z, 7AA, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N, 8O, 8P	<i>Students will understand that...</i> - The mechanical, electrical, and plumbing systems in a commercial building design. - Commercial buildings must meet the needs of various stakeholders, including users, clients, and the public. - Designing for commercial use requires adherence to accessibility, safety, and energy standards. - Commercial architecture integrates function, branding, and community context.	<i>Students will consider...</i> - Can the student list each subsystem of a commercial design? - What commercial codes need to be followed? - Why is it important to estimate the cost of construction for a building project? - What makes a building functional and appealing for commercial use? - How do regulations and accessibility laws shape commercial building design? - In what ways do commercial buildings reflect the communities they serve?
Learning Targets		
<i>Students will...</i> - Apply the concepts and principles of structural engineering, focusing on design loads, beam analysis, and the sizing of spread footings. - Demonstrate understanding of utility and service areas and the importance of how they make a commercial building system work effectively. - Integrate mechanical, electrical, and plumbing systems into a commercial building design.		
Unit Duration:		
7-8 weeks		

Unit 4: Commercial Building System

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1O, 1Q, 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2W, 2X, 2Z ■ Standard 4: Impacts of Technology ■ 4P, 4Q ■ Standard 7: Design in Technology and Engineering Education ■ 7Y, 7AA, 7BB, 7CC, 7DD ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8O	<i>Students will understand that...</i> ● Collaboration and teamwork play a key role in the success of a completed project ● Many stakeholders must be consulted in order to create a successful project. ● Effective communication is necessary to manage a building project. ● Mechanical, electrical, and plumbing systems are essential for functionality and comfort in commercial buildings. ● Building systems must be integrated into the design early to ensure efficiency and coordination. ● Sustainable practices and technologies reduce the environmental impact of commercial systems.	<i>Students will consider...</i> ● If you had to describe one strategy that would most help an architect/engineer to be a good and effective building project designer, what would it be? ● Stephen Covey includes “Begin with the End in Mind” as one of the seven habits listed in his book, The 7 Habits of Highly Effective People. How can this habit make an engineer/architect more effective? ● How important is it to an architect’s or civil engineer’s success that s/he possesses “people skills”? ● What are the major systems required for a functional commercial building? ● How do engineers and architects coordinate building systems during the design process? ● How can sustainable technologies be applied to commercial building systems?
Learning Targets		
<i>Students will...</i> ● Collaboratively work in groups to solve a commercial design project ● Design a commercial building using CAD that applies architectural and civil engineering concepts. ● Create a set of plans and presentation documents		
Unit Duration:		
8-10 Weeks		

Learning Plan

Week(s)	Topic	Resources/Texts	Learning Targets	Assessment
3-4	Overview of Civil Engineering and Architecture	PLTW Student Resources - Unit 1: Overview - History - Careers	- Identify the difference between engineering and architecture. - Identify engineering and architecture careers and the pathways to reach those careers. - Identify and give an example of architecture principles, elements, styles, and features - Comprehend and develop a design charrette using stakeholder point of views.	Completed projects, quizzes, tests and exams
10-12	Residential Design	PLTW Student Resources - Unit 2: Residential - Building Design and Construction - Cost and Efficiency Analysis - Residential Design	- Identify components of a residential building. - Design a residential building using CAD - Create a set of plans and presentation documents	- Completed projects, quizzes, tests and exams. - Revit House - Presentation Boards - Detailed Binder Outline - Set of Plans
7-8	Commercial Applications	PLTW Student Resources - Unit 4 Commercial Applications - Structures - Services and Utilities - Site Consideration	- Identify components of a commercial building. - Learn and apply the concepts and principles of structural engineering, focusing on design loads, beam analysis, and the sizing of spread footings. - Learn about utility and service areas and the importance of how they make a commercial building system work effectively.	- Completed projects, quizzes, tests and exams. - Revit Commercial Building - Presentation Boards - Detailed Binder Outline - Set of Plans

10-12	Commercial Building Systems	PLTW Student Resources ● Unit 4 Commercial Building Design ○ Design Problem ○ Design Presentation	● Work in groups to solve a commercial design project ● Design a commercial building using CAD ● Create a set of plans and presentation documents	
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Proficiency Scales for PLTW Civil Engineering and Architecture

Grade Level/Course: PLTW Civil Engineering and Architecture	Standard(s): ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T ■ ITEEA Standard 5: Influence of Society on Technological Development ■ 5J ■ ITEEA Standard 6: History of Technology ■ 6H ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7AA, 7CC Domain: History of Civil Engineering and Architecture
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Architectural scale models ● Identify architectural styles
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Can accurately describe and compare the roles of civil engineers and architects, and explain how they collaborate to solve real-world problems. ● Differentiates the art and science of Civil Engineering vs Architecture	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Can describe the basic responsibilities of civil engineers and architects and provide examples of their contributions.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Can identify civil engineering and architecture as related to the built environment and recognize examples of each in the community. ● Demonstrates understanding of various terminology such as engineering, architecture, etc.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Civil Engineering and Architecture	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1O, 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X, 2Z ■ ITEEA Standard 5: Influence of Society on Technological Development ■ 5J ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7AA, 7CC ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N Domain: Residential Design
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Create a set of construction plans using CAD ● Calculate proper residential utilities
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Produce a set of construction plans using CAD ● Use proper calculations to determine what size utilities are necessary ● Can create a complete residential design that balances client needs, zoning regulations, codes, and aesthetic considerations.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Produce sketches of construction plans ● Can develop a residential layout that includes basic space planning and addresses some client needs or regulations.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Can recall architectural terminology such as blueprints, floor plan, elevation, etc. ● Can identify parts of a residential structure and recognize the purpose of space planning and local codes.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Civil Engineering and Architecture	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1O, 1Q, 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7Y, 7Z, 7AA, 7CC, 7DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N, 8O, 8P Domain: Commercial Applications
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Calculate structural loads, beam analysis, and footings
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Accurately calculate structural loads, beam analysis, and footings ● Can produce a commercial design that integrates structural, accessibility, and energy considerations with client and community needs.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Students can Identify what areas of the building will carry a structural load. ● Can outline a basic commercial layout with some structural or accessibility elements in place.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Can recall structural load terminology such as, beam, vault, girder, post, etc. ● Can recognize features and purposes of commercial structures and explain their importance in communities.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Civil Engineering and Architecture	Standard(s): ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T ■ ITEEA Standard 5: Influence of Society on Technological Development ■ 5J ■ ITEEA Standard 6: History of Technology ■ 6H ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7AA, 7CC Domain: Commercial Building Systems
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Create a commercial Building ● Work collaboratively with a team ● Present a solution
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Work collaboratively in a team to design a commercial building. ● Can design and explain the integration of Mechanical, Electrical, and Plumbing (MEP) systems in a commercial project, considering sustainability and function.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Students can identify all aspects that go into a commercial building ● Can identify and place MEP systems in a commercial layout with general understanding of their functions.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal ● Can recall terminology for a commercial building such as, ADA, load, site, utilities, etc. ● Can describe the basic purpose of mechanical, electrical, and plumbing systems in commercial buildings.	

LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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PLTW Principles of Engineering

Course Overview

Grade level(s): 9-12	Credits earned: 1 credit (full year course) Prerequisite: PLTW Intro to Engineering Design or Instructor approval
Course Description	
Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of materials and structures, automation, and motion. Students develop skills in problem-solving, research, and design while learning strategies for design process documentation, collaboration, and presentation. Then, they apply what they know to take on challenges including building bridges, compound machine design and robots designed to perform specific tasks.	
Transfer Goals/Big Ideas	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses national standards for Industrial Technology) • Standard 1: Nature and Characteristics of Technology and Engineering ○ 1N - Explain how the world around them guides technological development and engineering design. ○ 1Q - Conduct research to inform intentional inventions and innovations that address specific needs and wants. ○ 1R - Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system. • Standard 2: Core Concepts of Technology and Engineering ○ 2T - Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making. ○ 2U - Diagnose a flawed system embedded within a larger technological, social, or environmental system. ○ 2V - Analyze the stability of a technological system and how it is influenced by all the components in the system, especially those in the feedback loop.	• Standard 5: Influence of Society on Technological Development ○ 5H - Evaluate a technological innovation that arose from a specific society's unique need or want. ○ 5I - Evaluate a technological innovation that was met with societal resistance, impacting its development. ○ 5J - Design an appropriate technology for use in a different culture. • Standard 6: History of Technology ○ 6F - Relate how technological development has been evolutionary, often the result of a series of refinements to basic inventions or technological knowledge. ○ 6G - Verify that the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools, materials, and processes. ○ 6H - Evaluate how technology has been a powerful force in reshaping social, cultural, political, and economic, and landscapes throughout history. • Standard 7: Design in Technology and Engineering Education ○ 7W - Determine the best approach by evaluating the purpose of the design. ○ 7X - Document trade-offs in the technology and engineering design process to produce the optimal design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints.

- 2W - Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste, while solving problems.
- 2X - Cite examples of the criteria and constraints of a product or system and how they affect final design.
- 2Y - Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.
- 2Z - Use management processes in planning, organizing, and controlling work.
- **Standard 3: Integration of Knowledge, Technologies, and Practices**
 - 3J - Connect technological progress to the advancement of other areas of knowledge, and vice versa.
- **Standard 4: Impacts of Technology**
 - 4P - Evaluate ways that technology can impact individuals, society, and the environment.
 - 4Q - Critique whether existing and proposed technologies use resources sustainably.
 - 4R - Assess a technology that minimizes resource use and resulting waste to achieve a goal.
 - 4S - Develop a solution to a technological problem that has the least negative environmental and social impact.
 - 4T - Evaluate how technologies alter human health and capabilities.

- 7Z - Apply principles of human-centered design.
- 7AA - Illustrate principles, elements, and factors of design.
- 7BB - Implement the best possible solution to a design.
- 7CC - Apply a broad range of design skills to their design process.
- 7DD - Apply a broad range of making skills to their design process.
- **Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems**
 - 8O - Develop a device or system for the marketplace.
 - 8P - Apply appropriate methods to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.
 - 8Q - Synthesize data and analyze trends to make decisions about technological products, systems, or processes.

Unit 1: Engineering Design Process

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1Q, 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2W, 2X, 2Y, 2Z ■ Standard 4: Impacts of Technology ■ 4P, 4Q, 4R, 4S, 4T ■ Standard 5: Influence of Society on Technological Development ■ 5H ■ Standard 6: History of Technology ■ 6F, 6G, 6H ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8O, 8P, 8Q	<i>Students will understand that...</i> ● The engineering design process is an iterative, systematic approach to problem solving. ● Engineering design is an iterative, problem-solving process grounded in creativity and critical thinking. ● Effective documentation supports communication, innovation, and future improvement. ● The design process integrates data, constraints, and user needs to drive innovation.	<i>Students will consider...</i> ● Can the student describe major steps of a design process and identify typical tasks involved in each step? ● Can the student document a design process in an engineering notebook according to best practices? ● How does the design process help engineers solve real-world problems? ● Why is documenting design decisions important in engineering? ● What role do constraints and criteria play in designing effective solutions?
Learning Targets		
<i>Students will...</i> ● Describe major steps of a design process and identify typical tasks involved in each step. ● Document a design process in an engineering notebook according to best practices. ● Represent concepts using a variety of visual tools, such as sketches, graphs, and charts, to communicate details of an idea.		
Unit Duration:		

Ongoing throughout the year

Unit 2: Mechanisms***Desired Results***

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1Q, 1R - Standard 2: Core Concepts of Technology and Engineering 2T, 2U, 2W, 2X, 2Y, 2Z - Standard 4: Impacts of Technology 4P, 4R, 4T - Standard 5: Influence of Society on Technological Development 5H - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8O, 8P	<i>Students will understand that...</i> - Students will use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations. - Simple machines and mechanisms transfer and transform motion and energy. - Mechanical advantage and efficiency are key concepts in evaluating mechanical systems. - Engineering systems require thoughtful analysis of motion, force, and energy relationships.	<i>Students will consider...</i> - What are some different types of occupations within the engineering pathway? - What are some common responsibilities of engineers? - What are some strategies that can be used to make everyday mechanisms more efficient? - In which situations would an engineer want to include a mechanism with a mechanical advantage greater than one? - What are the advantages of using mechanisms in these cases? - How could designing a solution to a mechanical problem without regard to efficiency be problematic? - How do simple machines make work easier? - What is the relationship between force, work, and mechanical advantage? - How can mechanisms be used to increase efficiency in engineered systems?
Learning Targets		
<i>Students will...</i> - Identify appropriate applications and examples of each of the six simple machines. - Describe the attributes and components of each of the six simple machines. - Distinguish between the six simple machines. - Identify the equations to solve for mechanical advantage, work, and power. - Measure forces and distances related to mechanisms. - Calculate mechanical advantage and drive ratios of mechanisms.	- Identify the equations for work and power. - Calculate work and power in mechanical systems. - Determine efficiency in a mechanical system. - Identify the equation for calculating the efficiency of a system. - Calculate the mechanical power developed when lifting an object. - Design, build, and test a machine that efficiently channels mechanical energy when friction and limited input energy are significant constraints.	

Unit Duration:
9 weeks

Unit 3: Energy Sources and Applications

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2T, 2X, 2Y, 2Z - Standard 6: History of Technology 6F - Standard 7: Design in Technology and Engineering Education 7W, 7Y, 7Z, 7CC, 7DD	<i>Students will understand that...</i> - Energy and power are essential for the construction of a system and its function. - Energy exists in different forms and can be transformed to perform work. - Engineers must consider energy efficiency and sustainability when designing systems. - Electrical circuits allow for control and transfer of energy within a system.	<i>Students will consider...</i> - What are the equations to calculate the resistance, current, and voltage of simple circuits? - How do you calculate electrical power developed in a circuit? - How do you calculate circuit resistance, current, and voltage using Ohm's law, including circuits with elements in series and/or parallel? - How do you compare and contrast the behavior of electrical circuits with parallel and series circuit designs? - What are some materials in your home that prevent energy transfer from inside your home to the outside environment? - How can energy be transferred or converted to do useful work? - What are the advantages and disadvantages of various energy sources? - How do engineers design systems that efficiently use and manage energy?

Learning Targets

<i>Students will...</i> - Identify the equations to calculate the resistance, current, and voltage of simple circuits. - Calculate electrical power developed in a circuit. - Calculate circuit resistance, current, and voltage using Ohm's law, including circuits with elements in series and/or parallel.	- Describe the use of reversible fuel cells as electrolyzers to store electrical energy. - Describe the use of solar cells to convert light energy into electricity. - Describe convection, conduction, and radiation as they relate to thermal energy transfer. - Design, construct, and test insulation materials for reducing thermal energy transfer. - Calculate the rate at which energy is transferred by conduction and radiation through materials having various R-values
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Compare and contrast the behavior of electrical circuits with parallel and series circuit designs.	
Unit Duration:	
9 weeks	

Unit 4: Statics <i>Desired Results</i>		
Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2T, 2W, 2X, 2Z - Standard 4: Impacts of Technology 4P, 4T - Standard 6: History of Technology 6F - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P, 8Q	<i>Students will understand that...</i> - The integrity of physical systems are dependent on their material properties and structural design. - Structural systems must remain in equilibrium to function safely. - Engineers use mathematical analysis to determine internal and external forces in structures. - Trusses and supports are designed based on force distribution and load-bearing requirements.	<i>Students will consider...</i> - Why is it crucial for designers and engineers to construct accurate free body diagrams of the parts and structures that they design? - Why must designers and engineers calculate forces acting on bodies and structures? - When solving truss forces, why is it important to know that the structure is statically determinate? - What conditions must be met for a structure to be in equilibrium? - How can truss designs be optimized for strength and efficiency? - How does understanding vector forces help in structural analysis?
Learning Targets		
<i>Students will...</i> - Differentiate between scalar and vector quantities. - Identify the magnitude, direction, and sense of a vector. - Explain how the forces acting on an object are in equilibrium. - Understand how Newton's Laws are applied to determine the forces acting on an object.	- Calculate the area moment of inertia of structural members. - Calculate the deflection of a center-loaded beam from the beam's geometry and material properties. - Calculate moments or torques given a force and a point of application relative to a specified axis. - Analyze and solve for the external and internal forces on a truss. - Use equations of equilibrium to calculate unknown external forces on a truss.	

● Create free body diagrams of objects, identifying all forces acting on the object. ● Calculate the x and y components of a given vector. ● Calculate moment of inertia, beam deflection, and moments or torques ● Mathematically locate the centroid of structural members.	● Use the method of joints to calculate tension and compression forces in the members of a statically determinate truss. ● Construct and destructively test a truss and relate observations to calculated predictions.
Unit Duration:	
4 weeks	

Unit 5: Material Properties and Testing

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1N, 1Q, 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2U, 2W, 2X, 2Z ■ Standard 4: Impacts of Technology ■ 4P, 4Q, 4S, 4T ■ Standard 5: Influence of Society on Technological Development ■ 5H, 5J ■ Standard 6: History of Technology ■ 6F ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8O, 8P, 8Q	<i>Students will understand that...</i> ● The integrity of physical systems are dependent on their material properties and structural design. ● Material selection impacts the strength, durability, and safety of a design. ● Engineers use stress-strain analysis to understand material behavior under load. ● Testing and evaluation of materials help inform safe and effective engineering solutions.	<i>Students will consider...</i> ● How does an engineer predict the performance and safety for a selected material? ● What are the advantages and disadvantages of utilizing synthetic materials designed by engineers? ● What ethical issues pertain to engineers designing synthetic materials? ● What is the significance of selecting appropriate materials for product design? ● How can an existing product be changed to incorporate different processes to make it less expensive and provide better performance? ● How does an engineer decide which manufacturing process to use for a given material? ● How do the recycling codes and symbols differ from state to state? ● How is material testing data useful? ● Stress-strain curve data points are useful in determining what specific material properties? ● How do engineers determine which materials are best for a design? ● What can stress-strain curves tell us about a material's properties? ● Why is it important to understand both destructive and non-destructive testing methods?
Learning Targets		

<i>Students will...</i> - Conduct non-destructive tests for material properties on selected common household products, including tests for continuity, ferrous metal, hardness, and flexure. - List material properties that are important to design, including mechanical, chemical, electrical, and magnetic properties. - Describe how formulas for stress and strain are applied to a material loaded with a tensile force.	- Describe how elastic and plastic deformation occurs in a material loaded with a tensile force. - Describe the modulus of elasticity. - Measure axial force and elongation data of material samples and create stress-strain diagrams describing the intrinsic properties of the materials. - Calculate minimum or maximum design parameters to ensure a safe or reliable product using material strength properties - Identify and calculate test sample material properties using a stress-strain curve
Unit Duration:	
2 weeks	

Unit 6: Machine Control <i>Desired Results</i>		
Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1Q, 1R - Standard 2: Core Concepts of Technology and Engineering 2T, 2U, 2V, 2W, 2X, 2Y, 2Z - Standard 4: Impacts of Technology 4P, 4S - Standard 5: Influence of Society on Technological Development 5H, 5I - Standard 6: History of Technology 6F, 6G - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P	<i>Students will understand that...</i> - A control system is integrated into a larger system as a means to coordinate input and output devices. - Automated systems rely on sensors, logic, and control algorithms. - Engineers use flowcharts, pseudocode, and programming to build functional control systems. - Understanding inputs, processes, and outputs is essential to designing effective automated systems.	<i>Students will consider...</i> - What are the advantages and disadvantages of using programmable logic to control machines versus monitoring and adjusting processes manually? - What are some every day, seemingly simple devices that contain microprocessors, and what function do the devices serve? - What questions must designers ask when solving problems to decide between digital or analog systems and between open or closed loop systems? - How do engineers design systems that control machines automatically? - What is the role of programming logic in machine control? - How do open- and closed-loop systems differ in response to inputs
Learning Targets		

Students will...

- Distinguish between digital and analog data, and between the inputs and outputs of a computational system.
- Distinguish between open- and closed-loop systems based on whether decisions are made using time delays or sensor feedback.
- Identify the relative advantage of an open-loop or closed-loop control system for a given technological problem.
- Create a flowchart to describe an algorithm.
- Create pseudocode to describe an algorithm.
- Analyze and describe an algorithm represented as a flowchart or as programming code.
- Create a computer program to implement an algorithm, including conditional statements and iterations.
- Based on given needs and constraints, design and create a control system, including the inputs, computer program, and outputs.
- Predict the behavior of a control system by examining the program it is going to execute.
- Evaluate algebraic and logical expressions involving programming variables.

Unit Duration:

8 weeks

Unit 7: Statistics

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2W, 2X, 2Y, 2Z ■ Standard 4: Impacts of Technology ■ 4P, 4R ■ Standard 5: Influence of Society on Technological Development ■ 5H ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7Y, 7Z, 7BB, 7CC ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8P, 8Q	<i>Students will understand that...</i> • Utilizing statistics to analyze testing results such as ballistic motion. • Statistical analysis helps engineers evaluate quality, reliability, and risk. • Understanding variation and probability is essential in engineering decision-making. • Statistical tools support data-driven improvements in design and production.	<i>Students will consider...</i> • Why is it crucial for designers and engineers to use statistics throughout the design process? • Why is process control a necessary statistical process for ensuring product success? • Why is theory-based data interpretation valuable in decision making? • Why is experiment-based data interpretation valuable in decision making? • How do engineers use statistics to make informed decisions? • What do measures of central tendency and variation reveal about a data set? • How can probability be used to evaluate the reliability of a process?

Learning Targets	
<i>Students will...</i> • Calculate the probability of making a set of observations in a series of trials where each trial has two distinct possible outcomes. • Calculate the theoretical probability that a simple event will occur. • Apply AND, OR, and NOT logic to probability. • Apply Bayes' Theorem to calculate a probability in a manufacturing context. • Calculate the variation in a set of data, including range, standard deviation, and variance. • Name measures of central tendency and variation and describe their meaning. • Calculate the central tendency of a data set, including mean, median, and mode. • Produce a frequency distribution to describe experimental results and create a histogram to communicate these results. • Distinguish between sample statistics and population statistics and know appropriate applications of each.	
Unit Duration:	
1 week	

Unit 8: Kinematics <i>Desired Results</i>		
Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2Y, 2Z ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y, 7BB	<i>Students will understand that...</i> • Free-fall motion of a projectile as having constant velocity in the horizontal direction and uniformly accelerating motion in the vertical direction. • Motion can be described mathematically through distance, velocity, and acceleration. • Engineers use kinematic analysis to design and control mechanical systems. • Projectile motion follows predictable patterns based on initial conditions and forces.	<i>Students will consider...</i> • What are the relationships between distance, displacement, speed, velocity, and acceleration? • Why is it important to understand and be able to control the motion of a projectile? • What is the relationship between velocity, acceleration, and time? • How can we predict the motion of a projectile? • How do engineers use kinematics to inform design?
Learning Targets		

<i>Students will...</i> • Describe free-fall motion of a projectile as having constant velocity in the horizontal direction and uniformly accelerating motion in the vertical direction. • Calculate acceleration due to gravity given data from a free-fall trajectory. • Determine the angle needed to launch a projectile a specific range given the projectile's initial velocity. • Calculate distance, displacement, speed, velocity, and acceleration from data. • Identify formulas related to motion of a projectile. • Calculate the location of a projectile at a specified time.
Unit Duration:
1 week

Unit 9: Fluid Power

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X, 2Y, 2Z ■ Standard 3: Integration of Knowledge, Technologies, and Practices ■ 3J ■ Standard 4: Impacts of Technology ■ 4P, 4T ■ Standard 7: Design in Technology and Engineering Education ■ 7Y, 7BB, 7CC, 7DD	<i>Students will understand that...</i> • Hydraulic and pneumatic systems use fluid pressure to transmit force and motion. • Engineers use physical laws like Pascal's Law and the gas laws to analyze fluid systems. • Fluid power systems must be designed for efficiency, safety, and functionality.	<i>Students will consider...</i> • What impact does fluid power have on our everyday lives? • Can you identify devices or systems that do not use fluid power that might be improved with the use of fluid power? • What are similarities and differences of mechanical advantage in simple machines and hydraulic systems? • Why are Pascal's Law, the perfect gas laws, Bernoulli's Principle, and other similar rules important to engineers and designers of fluid power systems? • What is the difference between hydraulic and pneumatic systems? • How does pressure affect performance in a fluid power system?

		How are fluid power systems used to control motion and force in machines?
Learning Targets		
<i>Students will...</i> - Identify devices that use hydraulic and pneumatic power. - Distinguish between hydrodynamic and hydrostatic systems. - Identify the advantages of hydraulic and pneumatic systems relative to each other. - Design, create, and test a hydraulic device. - Design, create, and test a pneumatic device. - Calculate flow rate, flow velocity, power, and mechanical advantage in a fluid power system. - Identify and explain basic components and functions of fluid power devices. - Calculate values in a pneumatic system using the ideal gas laws. - Calculate design parameters in a fluid power system utilizing Pascal's Law. - Distinguish between pressure and absolute pressure. - Distinguish between temperature and absolute temperature		
Unit Duration:		
1 week		

Learning Plan				
Week(s)	Topic	Resources/Texts	Learning Targets	Assessments
Design- Ongoing throughout the year	Engineering Design Process	PLTW Student Resources Unit 0	Describe the major steps of a design process, identify typical tasks involved in each step and document a design process in an engineering notebook according to best practices.	Documentation of the design process in the engineering notebook.

Weeks 1 - 10	Mechanisms	PLTW Student Resources Unit 1	Demonstrate understanding of mechanisms through the application of theory-based calculations accompanied by lab experimentation.	Completed projects, quizzes, tests and exams.
Weeks 11-20	Energy Sources and Applications	PLTW Student Resources Unit 3	- Demonstrate understanding that as energy and power are converted, losses occur in the system. - Demonstrate understanding that such losses affect the overall efficiency of the system.	Completed projects, quizzes, tests and exams.
Weeks 21-29	Machine Control	PLTW Student Resources Unit 2	Control mechanical processes using computer software and hardware.	Completed projects, quizzes, tests and exams.
Weeks 30-34	Statics	PLTW Student Resources Unit 4	Identify and calculate forces acting on a body when it is in static equilibrium.	Completed projects, quizzes, tests and exams.
Weeks 35-37	Material Properties and Testing	PLTW Student Resources Unit 0, 1, 2	- Calculate internal and external forces of a truss. - Design, build, and test their own truss designs. - Investigate the basic categories and properties of materials.	Completed projects, quizzes, tests and exams.

Week 38	Statistics	PLTW Student Resources Unit 0, 1, 2	Demonstrate understanding of the processes of gathering, organizing, interpreting, and formulating an understanding of data.	Completed projects, quizzes, tests and exams.
Week 39	Kinematics	PLTW Student Resources Unit 3	Demonstrate understanding of important aspects of motion and freefall.	Completed projects, quizzes, tests and exams.
Week 40	Fluid Power	PLTW Student Resources Unit 3	Students will be learning both pneumatic and hydraulic power. They will learn the basic components of each system and how they are designed to manipulate work and power.	Completed projects, quizzes, tests and exams.

Proficiency Scales for PLTW Principles of Engineering

Grade Level/Course: PLTW Principles of Engineering	Standard(s): - ITEEA Standard 1: Nature and Characteristics of Technology and Engineering 1Q, 1R - ITEEA Standard 2: Core Concepts of Technology and Engineering 2T, 2W, 2X, 2Y, 2Z - Standard 4: Impacts of Technology 4P, 4Q, 4R, 4S, 4T Domain: Engineering Design Process	- Standard 5: Influence of Society on Technological Development 5H - Standard 6: History of Technology 6F, 6G, 6H - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8O, 8P, 8Q
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Engineering Design - Projects (Building VEX V5 Robotics, Simple Machines, etc....) - Quizzes/Tests
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. Document a design process in an engineering notebook according to best practices.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. - Describe major steps of a design process and identify typical tasks involved in each step. - Represent concepts using a variety of visual tools, such as sketches, graphs, and charts, to communicate details of an idea.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. Recognize or recall specific terminology such as: Decision Matrix, Constraints	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Principles of Engineering	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1N, 1Q, 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2U, 2W, 2X, 2Y, 2Z ■ ITEEA Standard 4: Impacts of Technology ■ 4P, 4R, 4T Domain: Mechanisms	■ ITEEA Standard 5: Influence of Society on Technological Development ■ 5H ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y, 7Z, 7BB, 7CC, 7DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8O, 8P
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	● Compound Machine ● Project ● Simple Machine/Gear ● Projects ● Quizzes/Tests
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. ● Describe the attributes and components of each of the six simple machines. ● Identify appropriate applications and examples of each of the six simple machines. ● Measure forces and distances related to mechanisms. ● Calculate mechanical advantage and drive ratios of mechanisms. ● Calculate work and power in mechanical systems. ● Determine efficiency in a mechanical system.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. ● Distinguish between the six simple machines. ● Identify the equations to solve for mechanical advantage, work, and power. ● Identify the equation for calculating the efficiency of a system.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. ● Recognizes or recalls specific terminology such as: pulley, gear, inclined plane, wheel and axle, lever, screw, compound machine, efficiency, mechanical advantage, work, power	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Principles of Engineering	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ 1N, 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ 2T, 2X, 2Y, 2Z Domain: Energy Sources and Applications	■ ITEEA Standard 6: History of Technology ○ 6F ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ 7W, 7Y, 7Z, 7CC, 7DD
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Energy Source Research • Project • Quizzes/Tests • Heat Box Insulation Project
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Identify energy sources and describe the conversion from one source to another. • Design, construct, and test insulation materials for reducing thermal energy transfer. • Calculate the rate at which energy is transferred by conduction and radiation through materials having various R-values. • Calculate electrical power developed in a circuit. • Calculate circuit resistance, current, and voltage using Ohm’s law, including circuits with elements in series and/or parallel. • Compare and contrast the behavior of electrical circuits with parallel and series circuit designs.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Identify energy sources as renewable or nonrenewable. • Recognize or recall specific terminology such as: conduction, convection, radiation, R-value • Identify the equations used to calculate heat transfer • Recognize or recall specific terminology such as: series circuit, parallel circuit, voltage, resistance, current, ohms, volts, amperes, power performs basic processes, such as: • Identify the equations to calculate the resistance, current, and voltage of simple circuits. • Identify the correct units used in circuit calculations	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Recognize or recall specific terminology such as: solar energy, hydroelectric power, wind power, tidal energy, renewable, nonrenewable, geothermal energy, biomass	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Principles of Engineering	Standard(s): - ITEEA Standard 1: Nature and Characteristics of Technology and Engineering 1N, 1R - Standard 2: Core Concepts of Technology and Engineering 2T, 2W, 2X, 2Z Domain: Statics	- Standard 4: Impacts of Technology 4P, 4T - Standard 6: History of Technology 6F - Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y, 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8P, 8Q
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	- Truss Project - Quizzes/Tests
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. - Calculate moment of inertia, beam deflection, and moments or torques - Mathematically locate the centroid of structural members. - Calculate the area moment of inertia of structural members. - Calculate the deflection of a center-loaded beam from the beam's geometry and material properties. - Calculate moments or torques given a force and a point of application relative to a specified axis. - Analyze and solve for the external and internal forces on a truss. - Use equations of equilibrium to calculate unknown external forces on a truss. - Use the method of joints to calculate tension and compression forces in the members of a statically determinate truss. - Construct and destructively test a truss and relate observations to calculated predictions.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. - Differentiate between scalar and vector quantities. - Identify the magnitude, direction, and sense of a vector. - Create free body diagrams of objects, identifying all forces acting on the object. - Calculate the x and y components of a given vector. - Explain how the forces acting on an object are in equilibrium. - Understand how Newton's Laws are applied to determine the forces acting on an object.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. Calculate the x and y components of a given vector.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Principles of Engineering	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1N, 1Q, 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2U, 2W, 2X, 2Z ■ ITEEA Standard 4: Impacts of Technology ■ 4P, 4Q, 4S, 4T Domain: Material Properties and Testing	■ ITEEA Standard 5: Influence of Society on Technological Development ■ 5H, 5J ■ ITEEA Standard 6: History of Technology ■ 6F ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y, 7Z, 7AA, 7BB, 7CC, 7DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8O, 8P, 8Q
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Tensile Project ● Tests/Quizzes
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Conduct non-destructive tests for material properties on selected common household products, including tests for continuity, ferrous metal, hardness, and flexure. ● Measure axial force and elongation data of material samples and create stress-strain diagrams describing the intrinsic properties of the materials. ● Calculate minimum or maximum design parameters to ensure a safe or reliable product using material strength properties. ● Identify and calculate test sample material properties using a stress-strain curve.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Recognize or recall specific terminology such as: tensile force, modulus of elasticity, stress, strain ● List material properties that are important to design, including mechanical, chemical, electrical, and magnetic properties. ● Describe how formulas for stress and strain are applied to a material loaded with a tensile force. ● Describe how elastic and plastic deformation occurs in a material loaded with a tensile force. ● Describe the modulus of elasticity	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify the terminology and formulas used to solve the problems.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Principles of Engineering	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ○ 1N, 1Q, 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ○ 2T, 2U, 2V, 2W, 2X, 2Y, 2Z ■ ITEEA Standard 4: Impacts of Technology ○ 4P, 4S Domain: Machine Control	■ ITEEA Standard 5: Influence of Society on Technological Development ○ 5H, 5I ■ ITEEA Standard 6: History of Technology ○ 6F, 6G ■ ITEEA Standard 7: Design in Technology and Engineering Education ○ 7W, 7X, 7Y, 7Z, 7BB, 7CC, 7DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8P
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Machine Control Project ● Marble Sorter Project ● Quizzes/Tests
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Create a computer program to implement an algorithm, including conditional statements and iterations. ● Based on given needs and constraints, design and create a control system, including the inputs, computer program, and outputs. ● Predict the behavior of a control system by examining the program it is going to execute. ● Evaluate algebraic and logical expressions involving programming variables.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Recognizes or recalls specific terminology such as: inputs, outputs, pseudocode ● Distinguish between digital and analog data, and between the inputs and outputs of a computational system. ● Distinguish between open- and closed-loop systems based on whether decisions are made using time delays or sensor feedback. ● Identify the relative advantage of an open-loop or closed-loop control system for a given technological problem. ● Create a flowchart to describe an algorithm. ● Create pseudocode to describe an algorithm. ● Analyze and describe an algorithm represented as a flowchart or as programming code.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify the code being used to solve the problem.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Principles of Engineering	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2W, 2X, 2Y, 2Z Domain: Statistics	■ ITEEA Standard 4: Impacts of Technology ■ 4P, 4R ■ ITEEA Standard 5: Influence of Society on Technological Development ■ 5H ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7W, 7Y, 7Z, 7BB, 7CC ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8P, 8Q
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Projects ● Tests/Quizzes
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Calculate the probability of making a set of observations in a series of trials where each trial has two distinct possible outcomes. ● Calculate the theoretical probability that a simple event will occur. ● Calculate the variation in a set of data, including range, standard deviation, and variance. ● Calculate the central tendency of a data set, including mean, median, and mode. ● Apply Bayes' Theorem to calculate a probability in a manufacturing context.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Calculate mean, median, mode, range, standard deviation, frequency distribution, Baye's theorem ● Distinguish between sample statistics and population statistics and know appropriate applications of each. ● Name measures of central tendency and variation and describe their meaning. ● Produce a frequency distribution to describe experimental results and create a histogram to communicate these results.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify the theorem needed to solve the equation.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Principles of Engineering	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2Y, 2Z ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7W, 7YX 7Y, 7BB Domain: Kinematics
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Projects ● Tests/Quizzes
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Calculate acceleration due to gravity given data from a free-fall trajectory. ● Determine the angle needed to launch a projectile at a specific range given the projectile's initial velocity. ● Calculate distance, displacement, speed, velocity, and acceleration from data. ● Calculate the location of a projectile at a specified time.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Recognize or recall specific terminology such as: distance, displacement, speed, velocity, acceleration ● Describe free-fall motion of a projectile as having constant velocity in the horizontal direction and uniformly accelerating motion in the vertical direction. ● Identify formulas related to motion of a projectile.	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. ● Identify the devices used in Kinematics.	

LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
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Grade Level/Course: PLTW Principles of Engineering	Standard(s): Fluid Power ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X, 2Y, 2Z ■ ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices ■ 3J ■ ITEEA Standard 4: Impacts of Technology ■ 4P, 4S ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7Y, 7BB, 7CC, 7DD Domain: Fluid Power
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Hydraulic Device ● Project ● Pneumatic Device ● Project ● Quizzes/Tests
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Design, create, and test a hydraulic device. ● Design, create, and test a pneumatic device. ● Calculate flow rate, flow velocity, power, and mechanical advantage in a fluid power system. ● Calculate values in a pneumatic system using the ideal gas laws. ● Calculate design parameters in a fluid power system utilizing Pascal's Law.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Recognize or recall specific terminology such as: pressure, absolute pressure, temperature, absolute temperature, hydraulic, pneumatic, Pascal's Law ● Identify devices that use hydraulic and pneumatic power. ● Distinguish between hydrodynamic and hydrostatic systems. ● Identify the advantages of hydraulic and pneumatic systems relative to each other. ● Identify and explain basic components and functions of fluid power devices. ● Distinguish between pressure and absolute pressure. ● Distinguish between temperature and absolute temperature	

1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Identify the devices used in fluid power.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

PLTW Capstone (Engineering)

Course Overview

Grade level(s): 11-12	Credits earned: 1 credit (full year course) Prerequisite: PLTW Principles of Engineering, PLTW Civil Engineering and Architecture or PLTW AP Computer Science Principles (must have taken at least 2 of the 3 of the prerequisite courses)
Course Description	
PLTW Capstone is a capstone course for students who are completing any of PLTW's high school programs. It is an open-ended research course in which students work in teams to design and develop an original solution to a well-defined and justified open-ended problem. Teams draw on the knowledge, skills, and interests of each member, as they perform research to select, define, and justify a problem. Given this collaboration, team members leave the course with a broadened skillset and an appreciation for learning from their peers. After carefully defining the design requirements and creating multiple solution approaches, student teams select an approach, create, and test or model their solution prototype. As they progress through the problem-solving process, students work closely with experts and continually hone their organizational, communication, and interpersonal skills, creative and problem-solving abilities, and their understanding of the integration of processes such as the design process, experimental design, and the software development process. At the conclusion of the course, teams present and defend their original solution to an outside panel. PLTW Capstone is appropriate for upper grade-level students who are interested in any technical career path because the projects students work on can vary with student interest, and the curriculum focuses on collaborative problem solving and project management. Students should take PLTW Capstone as the final PLTW course, because it requires application of the knowledge and skills introduced during the PLTW foundation courses. This course is not designed to teach additional content, but to empower students to find resources—mentors, subject matter experts, research articles, peers, and teachers—to meet their needs, bolster their skills, and solve the problem they have selected.	
Transfer Goals	
<i>Students will be able to independently use their learning to...</i> • Apply critical thinking and problem-solving skills to identify, analyze, and solve real-world technical problems. • Collaborate effectively on projects, using teamwork, communication, and task delegation—skills essential in the workplace, especially in engineering and construction fields. • Apply the design process learned in industrial tech courses (conceptualize, prototype, test, refine) to tackle challenges in various disciplines like product development, architecture, or graphic design.	
Priority Missouri Learning Standards/National Standards	
ITEEA Standards for Technological and Engineering Literacy grades 9-12 (MO uses national standards for Industrial Technology) • Standard 1: Nature and Characteristics of Technology and Engineering ○ 1N - Explain how the world around them guides technological development and engineering design. ○ 1Q - Conduct research to inform intentional inventions and innovations that address specific needs and wants.	• Standard 7: Design in Technology and Engineering Education ○ 7X - Document trade-offs in the technology and engineering design process to produce the optimal design. ○ 7Y - Optimize a design by addressing desired qualities within criteria and constraints. ○ 7BB - Implement the best possible solution to a design. ○ 7CC - Apply a broad range of design skills to their design process.

○ 1R - Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system. ● Standard 2: Core Concepts of Technology and Engineering ○ 2T - Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making. ○ 2X - Cite examples of the criteria and constraints of a product or system and how they affect final design. ○ 2Y - Implement quality control as a planned process to ensure that a product, service, or system meets established criteria. ○ 2Z - Use management processes in planning, organizing, and controlling work. ● Standard 3: Integration of Knowledge, Technologies, and Practices ○ 3I - Evaluate how technology enhances opportunities for new products and services through globalization. ● Standard 4: Impacts of Technology ○ 4P - Evaluate ways that technology can impact individuals, society, and the environment. ○ 4Q - Critique whether existing and proposed technologies use resources sustainably. ● Standard 5: Influence of Society on Technological Development ○ 5H - Evaluate a technological innovation that arose from a specific society's unique need or want. ○ 5I - Evaluate a technological innovation that was met with societal resistance, impacting its development.	○ 7DD - Apply a broad range of making skills to their design process. ● Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ○ 8N - Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. ○ 8Q - Synthesize data and analyze trends to make decisions about technological products, systems, or processes. Missouri Learning Standards - Science ● Energy ○ 9-12.PS3.A.3 ● Earth and Human Activity ○ 9-12.ESS3.A.1, A.2, ESS3.C.1, C.2, ESS3.D.1 ● Engineering Design ○ 9-12.ETS1.A.1, A.2, ETS1.B.1, ETS1.B.2
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Unit 1: The Capstone Journey

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1N, 1Q ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X, 2Z, ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7BB, 7CC Missouri Learning Standards - Science ■ 9-12.ESS3.A.2 ■ 9-12.ETS1.A.1 ■ 9-12.ETS1.A.2 ■ 9-12.ETS1.B.1	<i>Students will understand that...</i> ● Capstone projects offer opportunities for authentic, student-driven learning. ● Real-world problems are complex and require thoughtful investigation and planning. ● Collaboration and communication are essential in managing and sustaining long-term projects.	<i>Students will consider...</i> ● Why is it important to have Transportable Knowledge and Skills? ● What are core workplace skills that students and workers need to acquire that can be used across all stages of a career? ● What are characteristics of successful innovators? ● What mindset and skills are essential for success in an open-ended project? ● How does personal motivation shape the success of a Capstone journey? ● What makes a team effective when navigating complex, student-led work?
Learning Targets		
<i>Students will...</i> ● Demonstrate an ability to function on multidisciplinary teams. ● Communicate effectively with an audience based on audience characteristics. ● Demonstrate independent thinking and self-direction in pursuit of accomplishing a goal. ● Document a design process in an engineering notebook according to best practices.		
Unit Duration:		
Ongoing throughout the year		

Unit 2: Problem Validation

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1Q ■ Standard 2: Core Concepts of Technology and Engineering ■ 2X, 2Z ■ Standard 4: Impacts of Technology ■ 4P, 4Q Missouri Learning Standards - Science ■ 9-12.ESS3.A.1 ■ 9-12.ESS3.A.2 ■ 9-12.ESS3.D.7 ■ 9-12.ETS1.A.1 ■ 9-12.ETS1.A.2 ■ 9-12.ETS1.B.1 ■ 9-12.ETS1.B.2	<i>Students will understand that...</i> ● A well-defined and justified problem is the foundation of an effective solution. ● Empathy and user research are essential for understanding real-world needs. ● Validation requires critical thinking, iterative questioning, and support from diverse sources.	<i>Students will consider...</i> ● How would you describe major steps of a design process ? ● What are the typical tasks involved in each step? ● How do you demonstrate the design process in an engineering notebook according to best practices? ● Why is it crucial to use a design process when trying to solve complex problems? ● How do we know if a problem is worth solving? ● What research strategies help us understand user and stakeholder needs? ● How does problem definition affect the direction of the solution?
Learning Targets		
<i>Students will...</i> ● Describe major steps of a design process and identify typical tasks involved in each step. ● Document a design process in an engineering notebook according to best practices. ● Represent concepts using a variety of visual tools, such as sketches, graphs, and charts, to communicate details of an idea.		
Unit Duration:		
Ongoing throughout the year		

Unit 3: Solution Design

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 2: Core Concepts of Technology and Engineering ■ 2X, 2Y, 2Z ■ Standard 3: Integration of Knowledge, Technologies, and Practices ■ 3I ■ Standard 5: Influence of Society on Technological Development ■ 5H, 5I ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y Missouri Learning Standards - Science ■ 9-12.ESS3.C.1 ■ 9-12.ESS3.C.2 ■ 9-12.ETS1.A.1 ■ 9-12.ETS1.A.2 ■ 9-12.ETS1.B.1 ■ 9-12.ETS1.B.2	<i>Students will understand that...</i> ● Engineering design process is an iterative, systematic approach to problem solving. ● Successful solutions result from clear criteria, constraints, and informed design decisions. ● Iterative design includes brainstorming, prototyping, and refining based on feedback. ● Collaboration and diverse perspectives lead to more innovative outcomes.	<i>Students will consider...</i> ● How do you show evidence that the proposed design has merit beyond the classroom or lab as a real solution? ● How do you show evidence that the design could realistically get into the hands of the people the design is trying to help in a sustainable way? ● How is a design process an iterative, systematic approach to problem solving? ● How do teams generate and evaluate solution ideas? ● What makes a solution feasible, desirable, and viable? ● Why is iteration important in the design process?
Learning Targets		
<i>Students will...</i> ● Use resources to create and design their product. ● Document their entire design process.		
Unit Duration:		

Ongoing throughout the year

Unit 4: Prototyping and Testing

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 1: Nature and Characteristics of Technology and Engineering ■ 1R ■ Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X, 2Z ■ Standard 5: Influence on Society on Technological Development ■ 5H, 5I ■ Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8Q Missouri Learning Standards - Science ■ 9-12.PS3.A.3 ■ 9-12.ESS3.C.1 ■ 9-12.ESS3.C.2 ■ 9-12.ETS1.A.1 ■ 9-12.ETS1.A.2 ■ 9-12.ETS1.B.1 ■ 9-12.ETS1.B.2	<i>Students will understand that...</i> ● The use of the engineering design process as a way to iterative, systematic approach to design solutions. ● Testing and feedback are critical to refining solutions. ● Failure is a valuable part of the learning and design process. ● Prototype development must align with intended function and user expectations.	<i>Students will consider...</i> ● What is the plan to test the prototype design? ● How can I show others that the testing plan for each design requirement is a well thought out test and would yield believable data? ● Why are test criteria important in test design? ● How does having a highly functional prototype relate to testing? ● How does prototyping help improve the quality of a solution? ● What can we learn from failed tests or unexpected outcomes? ● How do we ensure our testing is fair, valid, and meaningful?
Learning Targets		

<i>Students will...</i> ● Use Technology resources to create, design and develop a prototype to solve their Problem Statement. ● Document a design process in an engineering notebook according to best practices.
Unit Duration:
Ongoing throughout the year

Unit 5: Project and Process Evaluation

Desired Results

Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy ■ Standard 2: Core Concepts of Technology and Engineering ■ 2Z ■ Standard 7: Design in Technology and Engineering Education ■ 7CC, 7DD ■ Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N Missouri Learning Standards - Science ■ 9-12.ETS1.A.1 ■ 9-12.ETS1.A.2 ■ 9-12.ETS1.B.1	<i>Students will understand that...</i> ● Reflection leads to improvement in both product and process. ● Documentation and evaluation help teams track progress and make informed adjustments. ● Project management is a skill that grows through practice and intentional feedback.	<i>Students will consider...</i> ● How can teams improve their processes during and after a project? ● What role does reflection play in refining the final outcome? ● How can we evaluate our collaboration and project planning effectively?
Learning Targets		
<i>Students will...</i> ● Document and reflect on their time solving their problem statement. ● Document a design process in an engineering notebook according to best practices.		

Unit Duration:
Ongoing throughout the year

Unit 6: Design Presentation <i>Desired Results</i>		
Standards	Enduring Understandings	Essential Questions
ITEEA Standards for Technological and Engineering Literacy - Standard 2: Core Concepts of Technology and Engineering 2Z - Standard 7: Design in Technology and Engineering Education 7BB, 7CC, 7DD - Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N Missouri Learning Standards - Science 9-12.ETS1.A.1 9-12.ETS1.A.2 9-12.ETS1.B.1	<i>Students will understand that...</i> - Presenting solutions builds confidence, communication skills, and professional readiness. - Effective communication requires knowing your audience and clearly articulating your work. - Defending your work demonstrates understanding and accountability.	<i>Students will consider...</i> - How do we communicate our ideas and process to a broader audience? - What makes a presentation clear, compelling, and professional? - Why is it important to be able to defend your choices and respond to critique?
Learning Targets		
<i>Students will...</i> Document and reflect on their time solving their problem statement.		

Document a design process in an engineering notebook according to best practices.
Unit Duration:
Ongoing throughout the year

<i>Learning Plan</i>				
Week(s)	Topic	Resources/Texts	Learning Targets	Assessments
Design-Ongoing throughout the year	Component 1: The Capstone Journey	PLTW Student Resources Component 1	Demonstrate an ability to function on multidisciplinary teams. Communicate effectively with an audience based on audience characteristics. Demonstrate independent thinking and self-direction in pursuit of accomplishing a goal.	Design process in the engineering notebook.
Weeks 1-3	Component 2: Problem Validation	PLTW Student Resources Component 2	Describe major steps of a design process and identify typical tasks involved in each step. Document a design process in an engineering notebook according to best practices. Represent concepts using a variety of visual tools, such as sketches, graphs, and charts, to communicate details of an idea.	Decision Matrix
Weeks 4-14	Component 3: Solution Designs	PLTW Student Resources Component 3	Use resources to create and design their product. Document their entire design process.	Completed projects and presentations. These will all be different depending on the “problem” the students have chosen to explore.

Weeks 15-27	Component 4: Prototyping and Testing	PLTW Student Resources Component 4	Document and reflect on their time solving their problem statement. Document a design process in an engineering notebook according to best practices.	Completed projects and presentations. These will all be different depending on the “problem” the students have chosen to explore.
Weeks 28-38	Component 5: Project and Process Evaluation	PLTW Student Resources Component 5	Document and reflect on their time solving their problem statement. Document a design process in an engineering notebook according to best practices.	Completed projects and presentations. These will all be different depending on the “problem” the students have chosen to explore.
Week 39-40	Components 6: Design Presentation	PLTW Student Resources Component 6	Document and reflect on their time solving their problem statement. Document a design process in an engineering notebook according to best practices.	Completed projects and presentations. These will all be different depending on the “problem” the students have chosen to explore.

Proficiency Scales for PLTW Engineering Capstone

Grade Level/Course: PLTW Engineering Capstone	Standard(s): ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1N, 1Q ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X, 2Z ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7W, 7BB, 7CC ■ MO Learning Standards - Science ■ 9-12.ESS3.A.2, ETS1.A.1, ETS1.A.2, ETS1.B.1 Domain: The Capstone Journey (Component 1)
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	● Engineering Design Project ● Quizzes/Tests ● Assessed with Rubric
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. ● Document a design process in an engineering notebook according to best practices.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. ● Develop a decision matrix	

	- Describe major steps of a design process and identify typical tasks involved in each step. - Represent concepts using a variety of visual tools, such as sketches, graphs, and charts, to communicate details of an idea.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Recognize or recall specific terminology such as: decision Matrix, constraints - Research and demonstrate understanding of patents	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Standard(s): - ITEEA Standard 1: Nature and Characteristics of Technology and Engineering 1Q - ITEEA Standard 2: Core Concepts of Technology and Engineering 2X, 2Z - ITEEA Standard 4: Impacts of Technology 4P, 4Q - Missouri Learning Standards - Science 9-12.ESS3.A.1, 9-12.ESS3.A.2, 9-12.ESS3.D.7, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1 , 9-12.ETS1.B.2 Domain: Problem Validation (Component 2) Element A
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Brainstorming activity - Writing a problem statement activity - Conducting market research - Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. Justify the problem statement using market research, expert knowledge, and beginning a business plan.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. Recognize or recall specific terminology such as: Market research, Business plan	

1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Develop a problem statement. • Identify a problem to solve.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Standard(s): Problem Validation (Component 2) ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1Q ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2X, 2Z ■ ITEEA Standard 4: Impacts of Technology ■ 4P, 4Q ■ Missouri Learning Standards - Science ■ 9-12.ESS3.A.1, 9-12.ESS3.A.2, 9-12.ESS3.D.7, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1 , 9-12.ETS1.B.2 Domain: Problem Validation (Component 2) Element B
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Patent searchers • Patent Summary Sheet • Create a solution matrix • Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Document patent findings and cite where they found the patent • Create a decision matrix to come up with a solution.	

2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. Recognizes or recalls specific terminology such as: Patents	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Demonstrates understanding of what research patents are - Develops a decision matrix	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Standard(s): Problem Validation (Component 2) - ITEEA Standard 1: Nature and Characteristics of Technology and Engineering 1Q - ITEEA Standard 2: Core Concepts of Technology and Engineering 2X, 2Z - ITEEA Standard 4: Impacts of Technology 4P, 4Q - Missouri Learning Standards - Science 9-12.ESS3.A.1, 9-12.ESS3.A.2, 9-12.ESS3.D.7, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1 , 9-12.ETS1.B.2 Domain: Problem Validation (Component 2) Element C
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Presentation of first 3 elements - Design specification activity - Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. - Create a test survey - Come up with a design proposal - Present their first 3 elements to the class.	

2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. Understands specific terminology such as: Design specifications & goals, Concept test survey, Project proposal	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Create a timeline documenting the project progress.. - Create design specifications.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Strand: Solution Design (Component 3) - ITEEA Standard 2: Core Concepts of Technology and Engineering 2X, 2Y, 2Z - ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices 3I - ITEEA Standard 5: Influence of Society on Technological Development 5H, 5I - ITEEA Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y - Missouri Learning Standards - Science 9-12.ESS3.C.1, 9-12.ESS3.C.2, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1 , 9-12.ETS1.B.2 Domain: Solution Design (Component 3) Element D
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Concept Development Activity - Selecting the Best Solution Activity - Concept Analysis Activity - Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. Design Concepts using analysis to generate and select best product solutions.	

	Develop a plan of action that has considerable merit and would easily support repetition and testing for effectiveness by others.
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. - Recognize or recall specific terminology such as: Concept development, Isometric, Orthographic, Solution path, Product concept, concept analysis - Selecting the best solution using the SCAMPER process
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Demonstrates understanding of what research patents are - Can recognize a decision matrix
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.

The SCAMPER model

Seven perspectives to provoke creative solutions to challenging problems.

S Substitute	C Combine	A Adapt	M Modify	P Put to another use	E Eliminate	R Reverse
Replace a part, material, or process with something else.	Join elements, ideas, or functions together in new ways – or find a new element you can merge with.	Modify something to better suit a new purpose, person or context.	Enlarge, reduce, change the shape, or alter attributes. Can a small change have a big effect?	Rather than changing the thing itself, consider changing the context it exists in.	Remove elements, simplify, or pare down to essentials. Is less more?	Flip the script, re-order your priorities, invert cause and effect, and turn it all upside-down.

BiteSize Learning

Grade Level/Course: PLTW Engineering Capstone	Strand: Solution Design (Component 3) - ITEEA Standard 2: Core Concepts of Technology and Engineering 2X, 2Y, 2Z - ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices 3I - ITEEA Standard 5: Influence of Society on Technological Development 5H, 5I - ITEEA Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y - Missouri Learning Standards - Science 9-12.ESS3.C.1, 9-12.ESS3.C.2, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1 , 9-12.ETS1.B.2 Domain: Solution Design (Component 3) Element E
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Complete Engineering Formula Sheet - Document Engineering Symbols - Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed.	

	- Propose a solution that is well substantiated with STEM principles and practices applicable to all or nearly all design requirements and functional claims. - Substantiate evidence that the application of STEM principles and practices by the student have been reviewed by two or more experts (qualified consultants and/or project mentors). - Document the reviews of experts that provide confirmation (verification) or detail necessary to inform a corrective response.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. - Recognizes or recall specific terminology such as: Engineering symbols, STEM principles and practices - Documents the Engineering Design Process - Uses an Engineering Formula Sheet	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Demonstrates understanding of what research patents are - Can recognize a decision matrix	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Standard(s): Solution Design (Component 3) - ITEEA Standard 2: Core Concepts of Technology and Engineering 2X, 2Y, 2Z - ITEEA Standard 3: Integration of Knowledge, Technologies, and Practices 3I - ITEEA Standard 5: Influence of Society on Technological Development 5H, 5I - ITEEA Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y - Missouri Learning Standards - Science 9-12.ESS3.C.1, 9-12.ESS3.C.2, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1 , 9-12.ETS1.B.2 Domain: Solution Design (Component 3) Element F
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	Viability of the Proposed Solution Activity

3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. - Propose that the design was carefully reviewed based on several relevant extra-functional considerations. - Pass judgment on design viability based on those considerations—the capacity of the proposed solution to address the problem—is clearly realistic and well supported with credible evidence.	- Project Presentation for each element to this point - Assessed with Rubric
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. - Recognize or recall specific terminology such as: Viability, Preliminary Design. - Completes the viability of the proposed solution. - Completes the Preliminary Design Review.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Demonstrates understanding and importance of a timeline - Understands the design specifications	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Standard(s): Prototyping and Testing (Component 4) - ITEEA Standard 1: Nature and Characteristics of Technology and Engineering 1R - ITEEA Standard 2: Core Concepts of Technology and Engineering 2T, 2X, 2Z - ITEEA Standard 5: Influence on Society on Technological Development 5H, 5I - ITEEA Standard 7: Design in Technology and Engineering Education 7W, 7X, 7Y - ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8Q - Missouri Learning Standards - Science 9-12.PS3.A.3, 9-12.ESS3.C.1, 9-12.ESS3.C.2, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1 , 9-12.ETS1.B.2 Domain: Prototyping and Testing (Component 4) Element G
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
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4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Virtual Solutions Activity • Mock Up Activity • Choosing Materials Activity • Resources Planning Activity • Identifying Incremental Testing Opportunities Activity • Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Clearly and fully explain the final prototype iteration and is constructed with enough detail to ensure that objective data on all or nearly all design requirements could be determined. • Keeping a checklist to make sure that all attributes (subsystems) of the unique solution that can be tested or modeled mathematically are addressed. • Support the justification that is provided for those attributes that cannot be tested or modeled mathematically and thus require expert review.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Recognize or recall specific terminology such as: Prototypes, Virtual Solutions, Mock ups, Resource Planning, Build Procedure.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Can identify materials based on each group's project. • Can identify a Building Procedure based on each group's project. • Can identify a mockup and virtual solution based on each group's project.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Standard(s): Prototyping and Testing (Component 4) ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X, 2Z ■ ITEEA Standard 5: Influence on Society on Technological Development ■ 5H, 5I Domain: Prototyping and Testing (Component 4) Element H	■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8Q ■ Missouri Learning Standards - Science ■ 9-12.PS3.A.3, 9-12.ESS3.C.1, 9-12.ESS3.C.2, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1 , 9-12.ETS1.B.2
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Performance Level Descriptor	Success Criteria	Sample Tasks ("How can I assess this standard?")
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the "on target" success criteria.	• Test Procedure Activity • Test Criteria Document • Assessed with Rubric
3 On Target	To achieve a 3, the "on target" (proficient) student meets all success criteria for the priority standard listed. • Through the conduct of several tests for high-priority requirements that are reasonably based on instructional contexts, or through physical or mathematical modeling, the student demonstrates considerable understanding of testing procedure, including the gathering and analysis of resultant data. • Analyze the effectiveness with which the design met stated goals and include a consistently detailed explanation and summary of the data from each portion of the testing procedure and from expert reviews, generously supported by pictures, graphs, charts, and other visuals. • Analyze the overall summary of the implications of all data and proceed with designing and solving the problem.	
2 In Progress	To achieve a 2, the "in progress" (basic) student meets all the success criteria below. • Recognize or recall specific terminology such as: Testing procedures, Test Criteria, Test Plan	
1 Getting Started	To achieve a 1, the "getting started" (below basic) meets all the success criteria below to show they are "getting started" toward the target goal. • Can Identify a Testing Criteria. • Can Identify a Testing Procedure.	
LND	The student's current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Standard(s): Prototyping and Testing (Component 4) ■ ITEEA Standard 1: Nature and Characteristics of Technology and Engineering ■ 1R ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2T, 2X, 2Z ■ ITEEA Standard 5: Influence on Society on Technological Development ■ 5H, 5I ■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7W, 7X, 7Y ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8Q ■ Missouri Learning Standards - Science
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	9-12.PS3.A.3, 9-12.ESS3.C.1, 9-12.ESS3.C.2, 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1, 9-12.ETS1.B.2 Domain: Prototyping and Testing (Component 4) Element I
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	- Test and Evaluate the Prototype. - Redesign and Refine the Prototype. - Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. - Document the project evaluation by multiple, demonstrably qualified stakeholders and field experts is presented and is synthesized in a consistently specific, detailed, and thorough way. - Document sufficiently in two or more categories to yield meaningful analysis of that evaluation data. - Synthesizing the evaluations consistently addresses evaluators’ specific questions, concerns, and opinions related to design requirements.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. Recognize or recall specific terminology such as: Critical Design Review, Redesign and Refine	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. - Can Identify the process of Test and Evaluate of the Prototype. - Can Identify the process of Redesign and Refine of the Prototype.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	

Grade Level/Course: PLTW Engineering Capstone	Strand: Project and Process Evaluation (Component 5) - ITEEA Standard 2: Core Concepts of Technology and Engineering 2Z Domain: Project and Process Evaluation (Component 5) Element J, K, L	- ITEEA Standard 7: Design in Technology and Engineering Education 7CC, 7DD - ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems 8N - Missouri Learning Standards - Science 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1
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Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Presentation - Prep • Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Document the project evaluation using multiple, demonstrably qualified stakeholders and field experts to present and is synthesized in a consistently specific, detailed, and thorough way. • Document sufficiently in two or more categories to yield meaningful analysis of that evaluation data; the synthesis of evaluations consistently addresses evaluators’ specific questions, concerns, and opinions related to design requirements. • Provide a consistently clear, insightful, and comprehensive reflection on, and value judgment of, each major step in the project. • Reflect on their product and include a substantive summary of lessons learned that would be clearly useful to others who attempt the same or similar project. • Include consistently detailed and salient recommendations regarding the conduct of the same or similar project in the future. • Make recommendations to include caveats as warranted and specific ways the project could be improved with consistently detailed plans for the implementation of those improvements.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Recognize or recall specific terminology such as: External evaluation, Personal Reflection, Designer Recommendations • Prepare a presentation that documents the process.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Can Identify a timeline. • Can Identify design specifications.	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	
Grade Level/Course: PLTW Engineering Capstone	Standard(s): Prototyping and Testing (Component 6) ■ ITEEA Standard 2: Core Concepts of Technology and Engineering ■ 2Z Domain: Prototyping and Testing (Component 6) Element M and N	■ ITEEA Standard 7: Design in Technology and Engineering Education ■ 7BB, 7CC, 7DD ■ ITEEA Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems ■ 8N ■ Missouri Learning Standards - Science ■ 9-12.ETS1.A.1, 9-12.ETS1.A.2, 9-12.ETS1.B.1

Performance Level Descriptor	Success Criteria	Sample Tasks (“How can I assess this standard?”)
4 Advanced	To achieve a 4, the advanced student displays the application of the standard beyond the “on target” success criteria.	• Presentation • Assessed with Rubric
3 On Target	To achieve a 3, the “on target” (proficient) student meets all success criteria for the priority standard listed. • Show that their portfolio provides consistently clear, detailed, and extensive documentation of the design process and project that would with certainty facilitate subsequent replication and refinement by the designers and/or others. • Explain their design to an audience and the purpose was abundantly evident in the choice of modes of presentation, professionalism of style and tone, and the variety, quality, and suitability of supporting materials. • Make abundantly clear the evidence of the ability to write consistently clear and well-organized texts that are developed to the fullest degree suitable for the audience and purposes intended (to explain, question, persuade). • Make texts consistently demonstrate the ability to adjust language, style, and tone to address the needs and interests of a variety of audiences (expert, informed, or general/lay audience) and to use a wide variety of forms which are commonplace among STEM disciplines (notes, descriptive/narrative accounts, research reports). • Appropriately documented in standardized form (APA) is consistently evident.	
2 In Progress	To achieve a 2, the “in progress” (basic) student meets all the success criteria below. • Recognize or recall specific terminology such as: Rules of Quarters, Three Panel Display, Technical writing.	
1 Getting Started	To achieve a 1, the “getting started” (below basic) meets all the success criteria below to show they are “getting started” toward the target goal. • Can Identify Research patents • Can Identify a decision matrix	
LND	The student’s current level of proficiency in the specified standard is not yet determinable, providing for the opportunity for targeted support.	