

Definitions

CALPADS	California Longitudinal Pupil Achievement Data System
CTE Technical Prep	A course within a CTE technical career pathway or program that has been articulated with a postsecondary education or through an apprenticeship program of at least 2 years following secondary instruction.
Instructional Level Code	Represents a nonstandard instructional level at which the content of a specific course is either above or below a 'standard' course instructional level. These levels may be identified by the actual level of instruction or identified by equating the course content and level of instruction with a state or nationally recognized advanced course of study, such as IB or AP.
Instructional Level Honors, UC Certified	Includes all AP courses.
Instructional Level Honors, non UC Certified	Requires Board approval.
Instructional Level College	Includes ACE courses. Equivalent to college course and content, but not an AP course. Not related to section, but to course.

EDUCATIONAL SERVICES

Course Title: Introduction to Manufacturing and Engineering

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EDUCATIONAL SERVICES

Department: **CTE**

Course Title: **Introduction to Manufacturing and Engineering**

Course Number: _____

Unit Title: **Introduction to Solid Modeling**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Manufacturing and Product Development Pathway <https://www.cde.ca.gov/ci/ct/sf/documents/manproddev.pdf>
D4.0 Apply various two-dimensional (2-D) graphic and/or three-dimensional (3-D) modeling techniques to development concept.

D4.1 Create a preliminary design of a product concept utilizing drawing, computer software (graphic or CAD), and/or conceptual model fabrication techniques.

D4.2 Identify materials, mechanisms, technologies, and other requirements (e.g., safety, manufacturing, sustainability) the concept may require.

D4.3 Analyze and assess the strengths and weaknesses in the design, function, ergonomics, features, and benefits and identify possible resolutions for improvement.

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

What is Solid Modeling-

-Students will learn the capabilities and foundations of modern Solid Modeling software.

-Students will be able to describe the purpose of solid modeling software in the context of the development of mechanical designs to create physical prototypes and finished products.

Solid Modeling Workflows -

-Students will be able to conduct the appropriate steps within solid modeling software to create features

-Students will be able to conduct the appropriate steps with solid modeling software to create dimensioned representations of designed parts for communication of design intention, this can be through traditional orthographic projections or new technology driven and industry accepted methods.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Students will learn through direct instruction of techniques and practice of specific solid modeling software.

Students will focus on practice of using the solid modeling software by redesigning existing parts from orthographic drawings. Modeling exercises will increase in complexity throughout the term to expand students' problem solving skills and ability to apply their foundational skills to less well defined problems.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Students will conduct guided formative assignments demonstrating practice of mastery of the solid modeling software and design skill. Students will begin by modeling based off of existing and established orthographic and isometric drawings. As skills and experience grow, students will conduct larger more creative original designs using the solid modeling software to display a summative mastery and ability to apply their knowledge to create a unique design.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Posted online video tutorials will provide backing and continuously available for repeated watching. Peer assistance from advanced students will be available all periods. Additional one on one mentor training can be arranged during tutorial sessions as required.

EDUCATIONAL SERVICES

Department: **CTE**

Course Title: **Introduction to Manufacturing and Engineering**

Course Number: _____

Unit Title: **Introduction to Measurement**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Manufacturing and Product Development Pathway: <https://www.cde.ca.gov/ci/ct/sf/documents/manproddev.pdf>

B1.0 Validate that a provided part meets specifications from its engineering drawing by comparing specifications (geometric dimensioning and tolerancing) and by demonstrating proper technique using appropriate precision measuring tools.

B1.1 Identify and describe how the isometric and the orthographic views and the tolerance, scale, and material from an engineering drawing are used with an actual part.

B1.2 Demonstrate the correct use of precision measuring tools such as vernier and dial calipers, height gages, and micrometers utilizing both English and Metric systems.

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

Students will be able to correctly identify and use various measurement tools to determine feature size and location of parts. Students will be able to document and make the determination if the measurements obtained on features of part meet or do not meet the desired quality requirements.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Students will be taught through direct instruction of use of the tools in hands-on exercises using features of known size and location to compare their measurements to known samples. Students will use this information to determine if features would be acceptable or not acceptable given specified design dimensions.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Formative assessments would take place from results of hands-on measurement activities measuring known samples. Summative assessments would be in students use of measurement tools to check and verify the dimensional qualities of their work against required project specifications.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Students will be given backing video tutorials that demonstrate the proper handling and use of the measurement devices that may be referred to at any time. Students may receive peer to peer assistance during formative assessments. Students will have multiple opportunities to practice and display mastery of measurement techniques upon submission of their finalized project.

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Department: **CTE**

Course Title: **Introduction to Manufacturing and Engineering**

Course Number: _____

Unit Title: **Introduction to Manufacturing Shop Safety**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Manufacturing and Product Development Pathway: <https://www.cde.ca.gov/ci/ct/sf/documents/manproddev.pdf>

6.0 Health and Safety Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the

Manufacturing and Product Design sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.

6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies. 3 MPD | California Career Technical Education Model Curriculum Standards

6.4 Set up a work area, or shop, to avoid potential health concerns and safety hazards including but not limited to ergonomics, electrical (shock), wires (tripping), fumes (lung health), noise (hearing loss), fire (burns), and so forth, incorporating ergonomics.

6.5 Practice personal safety when lifting, bending, or moving equipment and supplies.

6.6 Demonstrate how to prevent and respond to work-related accidents or injuries and emergencies.

6.7 Maintain a safe and healthful working environment. 6.8 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

Redefinition of Hazard and Danger in the context of the manufacturing space

- Students will know that in the manufacturing labs, hazards are risks that have the potential to do harm or result in negative consequences. Hazards can be managed through education, personal responsibility and maturity. Danger means an imminent harm based from ignorance, carelessness or lack of mature decision making. Dangerous behaviors and situations are unacceptable in the manufacturing spaces.

Hazard identification and management

-Students will be aware of the myriad hazards that exist within the manufacturing spaces and the methods to appropriately limit the risks of those hazards. These take the form of chemicals, electricity, sharp objects, heat and machinery and many others covered in the context of specific situations and processes. Students will be able to monitor their surroundings and identify hazards and address them appropriately at all times in the shop. Students will be knowledgeable in appropriate protective equipment to use at different workstations, and the specifics of safe operation of all machinery they are qualified to use.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Direct instruction in safe responsible practices while in a manufacturing environment. Role playing scenarios and posing what would you do questions and immediate feedback responses. Once demonstrating basic understanding of safety concerns in the shop environment, students will practice and experience safe habits by working in the shop space.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Formative written assignments to gain insight to students understanding of safety procedures. Formative assessments monitoring students in their early and initial actions in the manufacturing spaces. Students will demonstrate their safe behavior in all shop activities as an ongoing summative assessment. Students unable to follow safe practices will be given alternative assignments that do not require access to the shop floor, or may be relocated from the class. Once observed demonstrating safe independent abilities in the shop space students will be able to gain increased autonomy and access to manufacturing space resources.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Students will be given peer or TA mentors to assist with learning safety procedures and practices. Students will have access to online resources with key safety points addressed. Students that struggle with safe operation in the manufacturing spaces may be given alternative assignments that do not rely on shop space resources to accomplish.

EDUCATIONAL SERVICES

Department: **CTE**

Course Title: **Introduction to Manufacturing and Engineering**

Course Number: _____

Unit Title: **Introduction to Machining Processes**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

Manufacturing and Product Development Pathway: <https://www.cde.ca.gov/ci/ct/sf/documents/manproddev.pdf>

B4.0 Demonstrate a cutoff saw operation(s) to produce a length of bar stock to specification.

B4.1 Using a length of bar stock and a process specification or drawing, cut a length of bar stock matching the cut list and demonstrate no sharp edges.

B4.2 Cut one steel bar and one aluminum plate determining the correct or optimal blade material (carbon steel, high speed, or bimetal), the proper sawtooth set to use for each, and explain why.

B9.0 Produce parts to specification using a boring head or angular cutting with a sine bar, a keyway, and pockets with a typical vertical mill.

B9.1 Set up and safely operate a vertical milling machine.

B9.2 Demonstrate proper cutting tool selection and speeds and demonstrate an efficient setup to minimize work-holding setups.

B9.3 Produce a part with keyway to specification demonstrating proper end mill selection, proper tool-path, and proper speeds.

B9.4 Mill an angular surface on a square block using a vice, sine bar, and gage blocks; measure angle to ensure it meets the specification.

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

Saw Cutting

-Students will be able to safely use a hand hacksaw to cut metallic materials from a long bar.

-Students will be able to safely setup a powered band saw and accurately cut metallic material to the correct length from a longer bar.

Milling

-Students will be able to identify the a milling machine its proper use and functional parts.

-Students will be able to safely setup and operate a manual milling machine to make simple parts to a design specification.

-Students will be able to safely clean and do basic daily maintenance to maintain the safe and effective function of a manual milling machine.

Turning

-Students will be able to identify an lathe its proper use and functional parts.

-Students will be able to safely setup and operate a manual lathe to make simple parts to a design specification.

-Students will be able to safely clean and do basic daily maintenance to maintain the safe and effective function of a manual lathe.

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Students will receive direct instruction on the theory, vocabulary and appropriate use of milling machines and lathes. Students will use hands on projects to demonstrate the safe and effective use of the equipment. Projects will consist of elements that require students to properly use the basic function of conventional machines. As in the case of milling machines students will have to learn to square a vise to the table, find and set the origin of their work, drill holes and properly select and use milling cutters to remove material from workpieces. In lathe turning students will operate the machines to learn to turn faces and diameters, drilling and boring and single point threading.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Students will be given formative written assessments and demonstration check-offs at the machines to determine their understanding of the principals of safe use of mills and lathes. Students will submit finished parts made on a mill or lathe to demonstrate their ability to use the machinery effectively and safely.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Students will be working with peers to assist each other in pairs or small groups. Peer support will be a major component of these lessons to keep all students functioning safely and successfully.

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Department: **CTE**

Course Title: **Introduction to Manufacturing and Engineering**

Course Number: _____

Unit Title: **Introduction to Weldng Processes**

Content Area Standards (Please identify the source): List content standards students will master in this unit.

C8.0 Understand various joining or combining processes, including welding processes used in manufacturing, maintenance, and repair.

C8.1 Recognize the importance of base metal preparation and joint fit-up and alignment.

C8.2 Analyze and be able to defend various welding processes used to complete a fabrication, an assembly, or a repair.

C8.3 Produce a completed fabrication, an assembly, or a repair by using appropriate joining and mechanical fastening techniques and processes.

Unit Outline: A detailed descriptive summary of all topics covered in the unit. Explain what the students will learn, know and be able to do.

Overview of resistance welding processes

-Introduction to Gas Metal Arc Welding (GMAW) or also known as Metal Inert Gas (MIG) welding

Students will demonstrate a basic ability to safely setup and use this processes to weld mild steel

-Introduction to Gas Tungsten Arc Welding (GTAW) or also known as Tungsten Inert Gas (TIG) welding

Students will demonstrate a basic ability to safely setup and use this processes to weld mild steel

Instructional Strategies: Indicate how the Instructional Strategies support the delivery of the curriculum and the course goals. Indicate how assignments support the Anchor Standards.

Direct instruction on welding safety and theory as it relates to MIG and TIG welding. Students will do hands on practice to develop their skills to utilize these processes. Students will be able to make simple metal artwork, furniture or other non-critical structures that utilize various welding processes and techniques.

Assessments: Describe the Formative and Summative assessments that will be used to demonstrate learning and mastery of the standards.

Students will take written formative assessments to measure their understanding of welding safety and theory.

Students will submit samples of their welds as a summative assessment of their abilities to apply theory and practice to join mild steel with resistance welding processes.

Interventions: Describe methods used to support students who fail to master unit Formative and Summative assessments.

Peer supports will be used for this unit. Students will always work with a partner or small group for support, safety and assistance. One on one time with the instructor can be provided as needed to overcome apprehension and provide encouragement and confidence.