EL DORADO UNION HIGH SCHOOL DISTRICT
EDUCATIONAL SERVICES

Course of Study Information Page

COURSE TITLE
Advanced Manufacturing and Engineering Technology

DISTRICT COURSE NUMBER	4-DIGIT STATE COURSE CODE (COMPLETED BY SILT)
#0515	**5574**

Rationale:

Advanced Manufacturing and Engineering Technology provides students with experiences in graphic design production, machine tooling and forming, engineering design, and product innovation and design. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and skill preparation. This course emphasizes real-world, occupationally relevant experiences of significant scope and depth in manufacturing. The knowledge and skills are acquired to integrate hands-on, project-based, and work-based instruction. This course is designed to prepare students for entry into a career, postsecondary education, or advanced technical training. As the field of Manufacturing continues to evolve worldwide, students graduating with training in Manufacturing, will be better prepared to compete for positions in the job market.

Course Description that will be in the Course Directory:

Advanced Manufacturing and Engineering Technology builds upon skills and knowledge learned in Manufacturing and Engineering Technology. This course will offer Sophomores, Juniors and Seniors the opportunity to further advance their skill proficiencies in the areas of graphic design, machine tooling and forming, engineering design, project planning, tool fitting, and product innovation and design. Comprehensive understanding and application of current safety standards and procedures will be a component of each study unit. Career planning, project innovation, and entrepreneurship will be integral parts of the course.

How Does this Course align with or meet State and District content standards?

This course is aligned with the Engineering and Architecture and Manufacturing and Product Development Sectors of the Career Technical Education model curriculum standards set by the California State Board of Education in January 2013.

NCLB Core Subjects:

Select up to two that apply:

☐ Arts	☐ Civics and Government	☒ Not Core Subject
☐ Economics	☐ History	
☐ English	☐ Mathematics	
☐ Foreign Language	☐ Reading / Language Arts	
☐ Geography	☐ Science	

CDE CALPADS Course Descriptors:

(See Page 2 for Definitions)

CTE TECH PREP COURSE INDICATORS	CTE COURSE CONTENT CODE	INSTRUCTIONAL LEVEL CODE
☐ Tech Prep (32) (Higher Ed)	☐ CTE Introductory (01)	☐ Remedial (35)
☐ Tech Prep & ROP(33) (Higher Ed)	☐ CTE Concentrator (02)	☐ Honors UC-Certified (39)
☐ ROP (30)	☒ CTE Completer (03)	☐ Honors Non UC-Certified (34)
☒ N/A	☐ Voc Subject _____	☐ College (40)
	☐ N/A	☒ N/A

Length of Course: ☒ Year ☐ Semester

Grade Level(s): ☐ 9 ☒ 10 ☒ 11 ☒ 12

Credit:

☒ Number of credits: **10**
☒ Meets graduation requirements (subject **CTE**)
☐ Request for UC "a–g" requirements
CSU/UC requirement _____

☐ College Prep

Prerequisites:	Manufacturing and Engineering Technology (#0516)
Department(s):	CTE
District Sites:	Oak Ridge High School
Board of Trustees COS Adoption Date:	June 9, 2015
Textbooks / Instructional Materials:	Mastercam Software Handbook
Funding Source:	Site, Perkins, CTE, and CRANE grant.
Board of Trustees Textbook Adoption Date:	NA

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.

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Department: **Career and Technical Education**

Course Title: **Advanced Manufacturing and Engineering Technology** Course Number: **#0515**

Unit Title: **Manufacturing Shop Safety**

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

CTE Anchor Standards:
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.
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.
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

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:
1. Identify major work areas in a Manufacturing Shop and explain the function and use of each area
2. Understand, explain and demonstrate how to create a safe work environment
3. Understand and utilize the safety color coding system for shops
4. Identify and utilize safety gear and protective clothing required in each area of the shop
5. Understand the principles of combustion
6. Understand how to match appropriate types of fire extinguishers to each class of fire
7. Understand and interpret labels on hazardous materials
8. Describe actions/steps required in case of fire, accident, or other shop emergency
9. Understand and appropriately apply all shop policies and procedures

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

1. Orient and explain each area of the shop; its function, specific safety needs/concerns, and suggested or required safety gear and clothing
2. Shop and safety tests
3. Develop several different shop/work scenarios and require students to identify safety issues/violations and the steps necessary to correct each problem
4. Explain when and how to use safety gear and protective clothing
5. Teacher led discussion, videos demonstrations on the use of safety equipment and policy
6. Hands-on lab to ensure students understand how to identify hazardous materials and the procedures to follow in case of fire, accidents or other shop emergencies.
7. Quiz on shop policies and procedures
8. Hands-on lab to reinforce all topics covered in this unit.

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

1.Hands-on lab will allow students to demonstrate safety procedures. It will afford the instructor the opportunity to observe each student's progress and correct errors timely and ensure student's understand and can apply concepts.
2. Periodically scheduled cleanings will ensure a clean and safe worksite and help monitor student's complaince and understanding
3. Hands-on lab will help ensure student understand what constitutes a hazardous situation and the steps necessary to correct and/or report the situation
4. Written evaluations and instructor observation on safety practices
6. Daily assignments and labs, safety and shop tests
7. Instructor observation

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

1. Hands-on Labs will allow the teacher the opportunity to identify students who are struggling and provide one-on-one instruction
2. Peer instruction
3. Establish a "retake" policy for tests and quizes when a student scores below 75% or below 90% on safety tests

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Department: **Career and Technical Education**

Course Title: **Advanced Manufacturing and Engineering Technology** Course Number: **#0515**

Unit Title: **Project Inovation Preperation and Planning**

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

Manufacturing and Product Development Pathway Standards - MPDPS:
D1.0 Understand the basic product design and development process as it relates to the design of a product, line of products, system design, or services.
D1.1 Identify the variations in the product design and development process as it relates to the designing of a product, product line, system design, or service.
D1.2 Apply and identify the various phases of the product design development process to an existing product, product line, system design, or service.
D2.0 Understand and apply research methodologies as a means to identify a need, problem, or opportunity for a new product, product line, system design, or service.
D2.1 Employ research methodologies, using primary research and electronic reference materials, to gather information relevant to the topic or area of opportunity.
D2.2 Organize information to identify and define an area of opportunity, need, or problem that can be resolved through design.
D2.3 Identify potential design areas (e.g., product, product line, system design, or service) that would address the need, problem, or opportunity.
D2.4 Research and identify the user demographic for the product, product line, system design, or service (local, national, global market).
D3.0 Understand and apply various ideation techniques to develop ideas and concepts.
D3.1 Apply ideation techniques to explore and produce multiple concepts.
D3.2 Edit concepts and identify key idea(s) that solve the problem, fulfill a need, or address an opportunity.
D3.3 Assess the environmental impact of the design solution and other sustainability issues and product life cycle considerations.
D3.4 Synthesize information and experiment with nontraditional possibilities for innovative design solutions.
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.

Engineering and Arcitecture Pathway Standards - EAPS:
B6.0 Employ the design process to solve analysis and design problems.
B6.1 Understand the steps in the design process.
B6.2 Determine what information and principles are relevant to a problem and its analysis.
B6.3 Choose between alternate solutions in solving a problem and be able to justify the choices made in determining a solution.
B6.4 Translate word problems into mathematical statements when appropriate.
B6.5 Demonstrate the process of developing multiple details, within design constraints, into a single solution.
B6.6 Construct a prototype from plans and test it.
B6.7 Evaluate and redesign a prototype on the basis of collected test data.
C3.0 Understand the sketching process used in concept development.
C3.1 Apply sketching techniques to a variety of architectural models.
C3.2 Produce proportional two- and three-dimensional sketches and designs.
C3.3 Present conceptual ideas, analysis, and design concepts using freehand, graphic, communication

techniques.

Reading Standards for Literacy in Science and Technical Subjects –RLST
11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

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:
1. Identify common drawing tools; define and explain drawing symbols and their uses
2. Explain the difference between pictorial and three-view drawings; read and interpret a drawing
3. Create a digital project drawing
4. Define terms associated with a bill of materials; explain the components of a bill of materials
5. Prepare a written bill of materials
6. Select and plan for an advanced level manufacturing project
8. Create or modify project plans

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

1. Explain and train students in the use of common drawing tools and symbols
2. Illustrate the differences between pictorial and three-view drawings and explain how to read and interpret each.
3. Hands-on Lab to allow students practice in interpreting and sketching drawings
4. Quiz on drawing tools, symbols, and types of drawings and their uses
5. Explain the components that comprise a bill of materials, related terms, and required calculations
6. Quiz on preparation of a bill of materials
7. Consult with and advise students on how to select a manufacturing project
8. Individual student project will allow students to practically apply advanced knowledge and skills learned.

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

Student demonstrations, quizes, labs and an Individual Student Project will demonstrate the proficiency level of each student. These types of assessment tools will allow the instructor to quickly identify problem areas and take appropriate steps to ensure a high level of proficiency for all students.

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

1. Hands on Labs will allow the teacher the opportunity to provide one-on-one instruction to students who are struggling with the Unit concepts and application
2. Peer instruction

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Department: **Career and Technical Education**

Course Title: **Advanced Manufacturing and Engineering Technology** Course Number: **#0515**

Unit Title: **Project Innovation Implementation**

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

Manufacturing and Product Development Pathway Standards - MPDPS:
D5.0 Develop the concept into a well-defined product for prototyping.
D5.1 Produce technical drawings and other specifications required for the prototyping or manufacturing of the product.
D5.2 Recognize the safety issues related to the reliability, functionality, and use of the product.
D5.3 Communicate and collaborate with fabricators, manufacturers, engineers, technologists, or other industry experts to review requirements and specifications and to validate the design.
D6.0 Produce a prototype of a product.
D6.1 Build a looks-like, works-like prototype of the model using the appropriate fabrication, manufacturing, or reproduction techniques or technologies.
D6.2 Assess the outcome of the prototype product and analyze any issues that need redesigning or refining related to function, construction, or other factors.
D6.3 Resolve and/or redesign issues with a prototype.
D7.0 Evaluate the prototype to determine if it meets the requirements and objectives.
D7.1 Create a performance criteria and a quality standard to measure and evaluate a prototype.
D7.2 Test the functionality and other features of the prototype against the performance criteria and quality standard and evaluate the results.
D7.3 Identify any redesigning or additional corrections required to improve the overall quality, look, and performance of the prototype model.

Engeneering and Archtecture Pathway Standards - EAPS:
C2.0 Understand the effective use of engineering design equipment.
C2.1 Employ engineering design equipment using the appropriate methods and techniques.
C2.2 Apply conventional engineering design equipment procedures accurately, appropriately, and safely.
C2.3 Apply the concepts of engineering design to the tools, equipment, projects, and procedures of the Engineering Design Pathway.

Reading Standards for Literacy in Science and Technical Subjects – RLST:
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST:
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

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.

1. Complete (from start to finish) an advanced manufacturing project to include:
- design
- pattern creation
- material selection
- layout
- tool selection
- cutting
- assembly
- finishing

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

1. Hands-on labs demonstrating steps/processes in the different phases of project construction.
2. Advanced manufacturing project
3. Manufacturing lab demonstration
4. Individual student work time with assistance from instructor

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

1. Completion of an advanced manufacturing project will demonstrate student skill proficiencies in key areas
2. Teacher led disscussions will allow for student feedback enabling the instructor to identify problem areas

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

1. Individualized teacher intervention as needed
2. Peer instruction

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Department: **Career and Technical Education**

Course Title: **Advanced Manufacturing and Engineering Technology** Course Number: **#0515**

Unit Title: **Manufacturing Entreprenership**

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

Manufacturing and Product Development Pathway Standards - MPDPS:
D8.0 Understand and apply basic business and entrepreneurial principles and identify potential markets and/or other business opportunities for distribution of the product.
D8.1 Apply research methodologies to identify potential investors or business opportunities to market the product.
D8.2 Create a marketing plan for the product that includes target consumer, price, product name, brand, and product positioning in the retail market.
18 MPD | California Career Technical Education Model Curriculum StandardsD
9.0 Produce a package design concept for a product or line of products.
D9.1 Understand physical packaging construction and materials used; e. g., chipboard, cardboard, PVC, plastic blisters, etc. as it relates to protecting the product, costs, and logistic requirements.
D9.2 Understand and apply packaging graphic strategies that effectively communicate and influence the purchasing of the product.
D9.3 Create a packaging concept utilizing drawing computer software (graphic or CAD).
D9.4 Produce a physical package with graphics for the product.
D10.0 Produce a presentation of the product, product line, system design, or service.
D10.1 Create a presentation of the design solution (e.g., product, product line, system design, or service) that effectively communicates its features and benefits.
D10.2 Integrate into the presentation a marketing plan that may include an advertisement, promotion, and packaging/retail strategy using one or more visual communication tools (e.g., graphics, multimedia).

Engineering and Arctitecture Pathway Standards - EAPS:
B10.0 Design and construct a culminating project effectively using engineering technology.
B10.1 Use methods and techniques for employing all engineering technology equipment appropriately.
B10.2 Apply conventional engineering technology processes and procedures accurately, appropriately, and safely.
B10.3 Apply the concepts of engineering technology to the tools, equipment, projects, and procedures of the Engineering Technology Pathway.

Reading Standards for Literacy in Science and Technical Subjects – RLST
11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

Writing Standards – WS
11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, includingnew arguments or information.
11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation including footnotes and endnotes.
11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

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:
1. Create a marketing plan including advertising, pricing, target market, and target consumers
2. Design a packaging plan for their product as it relates to protection, cost and logistics
3. Create and deliver a presentation explaining the use of the product and sales potential

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

1. teacher led lecture demonstrating steps/processes in the different phases of project marketing
2. Advanced manufacturing project marketing plan
3. Advanced manufacturing packaging plan
4. Induvidual student work time with assistance from instructor

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

1. Marketing plan graded by predetermined rubric
2. Evaluation of packaging by predetermined rubric
3. Student presentation evaluated by teacher and peers

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

1. Individualized teacher intervention as needed
2. Peer instruction

EL DORADO UNION HIGH SCHOOL DISTRICT

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Department: **Career and Technical Education**

Course Title: **Advanced Manufacturing and Engineering Technology** Course Number: **#0515**

Unit Title: **Career Exploration**

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

CTE Anchor Standards:
3.0 Career Planning and Management - Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.
3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
3.2 Evaluate personal character traits, such as trust, respect, and responsibility, and understand the impact they can have on career success.
3.3 Explore how information and communication technologies are used in career planning and decision making.
3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

7.0 Responsibility and Flexibility - Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Engineering and Architecture sector workplace environment and community settings.
7.1 Recognize how financial management impacts the economy, workforce, and community.
7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
7.3 Understand the need to adapt to changing and varied roles and responsibilities.
7.4 Practice time management and efficiency to fulfill responsibilities.
7.5 Apply high-quality techniques to product or presentation design and development.
7.6 Demonstrate knowledge and practice of responsible financial management.
7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.

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.

The student will:
1. List two to five careers for each area within manufacturing and Engineering
2. Identify skill sets needed for three differnt careers in Manufacturing and Engineering
2. Develop a detailed educational plan to prepare for a career in Manufacturing or Eningeering
3. Shadow a Manufacturing or Engineering professional in the field and prepare a written report about the experience
4. Create a portfolio showcasing skills learned throughout the course
5. Create a coverletter and resume aplicable to a career in the field

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

1. Career Search in Career Center and/or Naviance
2. Online career searches
3. Student Data Sheet listing careers selected and the skill sets and educational requirements for each.
4. Oral presentation
5. Have students identify skill sets they possess at the beginning of the course and then re-evaluate again at the end of the course
5. Written assignment on work shadow program
6. Have students prepare or update their resume and portfolio

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

1. Oral Presentations will demonstrate how thoroughly students researched selected careers and the educational and skill requirements for each
2. Self evaluations at the beginning and end of the course will teach students how to identify and assess their skill sets and effectively present this information in a resume or oral interview

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

1. Divide projects into multiple steps each with a separate due date
2. Review each step of a student's project to ensure an understanding of the project and expected outcome. This affords the instructor the opportunity to identify problem areas early and implement corrective actions as needed to allow students to successfully complete each project