



I. GENERAL COURSE INFORMATION

Subject and Number: Engineering Technology 18A
Descriptive Title: Engineering Design and Development I
Course Disciplines: Engineering Technology AND Manufacturing Technology
Division: Industry and Technology

Catalog Description:

This is the first course in a two-course sequence that covers engineering design and development concepts. In this capstone course, students work in teams to design and construct solutions to engineering problems. Emphasis will be placed on research methods, design problem statements, continuous improvement, cost analysis and prototyping. Knowledge gained will be applied to a design solution of a problem assigned in the capstone project.

Note: The two-course sequence Engineering Technology 18A and Engineering Technology 18B is the same as Engineering Technology 18.

Conditions of Enrollment:

Prerequisite: Engineering Technology 10 or Engineering Technology 10A AND Engineering Technology 10B or Engineering Technology 12 or Engineering Technology 12A AND Engineering Technology 12B or Computer Aided Design/Drafting 5 with a minimum grade of C in prerequisite

Course Length:	X Full Term	Other (Specify number of weeks)
Hours Lecture:	1.00 hours per week	TBA
Hours Laboratory:	2.00 hours per week	TBA
Course Units:	1.50	

Grading Method: Letter
Credit Status: Associate Degree Credit

Transfer CSU: X Effective Date: 12/15/2008
Transfer UC: No Effective Date:

General Education:

El Camino College:

CSU GE:

IGETC:

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

1. SLO #1 Engineering Notebook Students will develop and maintain an engineering notebook. This legal document contains all the information that is relevant to its purpose of original design. It includes contact information, correspondence, telephone logs, sketches and drawings, reference citations, collected data, and a chronological listing of the events dates and time, connected to the journal's purpose. Documentation is a vital part of engineering. In the case of liability suits, good documentation has kept many engineering firms out of court because it proved there was no wrong doing on their part.

2. SLO #2 Research Methodology & Technology

After carefully defining a technical problem, the student will use both research methodology and technology to choose, build, validate and justify an engineering solution to a design challenge.

3. SLO #3 Design Project

The student will employ the use of technologies and knowledge learned, in this and previous ETECH courses, to construct and test their design project.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the El Camino College SLO webpage at <http://www.elcamino.edu/academics/slo/>.

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Perform research using conventional libraries, the internet, and other resources.

Written homework

1. Explain how to research a U.S. Patent.

Performance exams

2. Create, simulate and test basic designs using industry standard computers and software.

Performance exams

3. Evaluate test results and other data for validity.

Performance exams

4. Interpret sketches, designs, and drawings for technical content.

Performance exams

5. Work independently to research, design, manufacture, test and evaluate mechanical, electronic or electromechanical assemblies.

Performance exams

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	2	I	SAFETY INSTRUCTION AND REVIEW TECHNIQUES IN COMPUTER AIDED DESIGN/DRAFTING (CADD) A. Overview of hand tools and basic power tools B. Review of CADD fundamentals
Lab	4	II	SAFETY LAB C. Power tool safety D. Hand tool safety
Lecture	4	III	RESEARCH METHODS A. Research methods 1. Formal research 2. Library resources 3. Computer-based research 4. Contacting experts B. Guided research 1. Problem statement 2. Alternative solutions 3. Presentation methods C. Independent research 1. Expectations and time management 2. Patent searches
Lab	8	IV	RESEARCH METHODS E. Research methods exercise F. Patent search exercise
Lecture	4	V	PROTOTYPE DEVELOPMENT PROTOCOL A. Prototype development B. Design C. Simulation D. Rapid-Prototyping E. Construction F. Testing and evaluation
Lab	8	VI	PROTOTYPE DEVELOPMENT PROTOCOL A. Design exercise B. Testing and evaluation exercise
Lecture	4	VII	CAPSTONE ENGINEERING PROJECT PROTOCOL A. Daily engineering journals B. Sketches, models and drawings C. Model simulation data and project photos D. Safety, reliability, and cost effectiveness
Lab	8	VIII	CAPSTONE ENGINEERING PROJECT PROTOCOL A. Documentation exercise B. Reliability exercise

Lecture	4	IX	CAPSTONE PROJECT CONSTRUCTION PROTOCOL A. Teamwork and delegation B. Component construction
Lab	8	X	CAPSTONE PROJECT CONSTRUCTION PROTOCOL A. Construction exercise B. Presentation exercise
Total Lecture Hours	18		
Total Laboratory Hours	36		
Total Hours	54		

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. PRIMARY METHOD OF EVALUATION:

Problem solving demonstrations (computational or non-computational)

B. TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:

Create a Standard Tessellation Lattice “STL” file in a scale within the capacity of the Rapid Prototype (RP) machine for the first solid model object created for your capstone project. Transmit the file to the RP machine and confirm the machine settings with your instructor before starting the part creation process.

C. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:

1. Access the United States Government Patent and Trademark Office web-site at www.uspto.gov and determine if there is a patent for a concept similar to the idea you have chosen for your capstone project. If you find a patent for a concept similar to your idea, write a one-page report which specifies the differences between your idea and the patent. If you did not find a patent for a concept similar to your idea, write a one-page report describing the steps you used in researching patents.
2. Analyze the mating parts required for your team's capstone project and specify the tolerances required for the assembly to function properly. Add the dimensions with tolerances to the working drawings and submit for critique and evaluation.

D. OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:

Performance exams
Other exams
Quizzes
Written homework
Laboratory reports
Class Performance
Term or other papers
Multiple Choice
Completion
True/False

V. INSTRUCTIONAL METHODS

- Demonstration
- Group Activities
- Guest Speakers
- Laboratory
- Lecture
- Multimedia presentations
- Simulation
- Other (please specify)
 - Computer simulations

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

- Study
- Required reading
- Problem solving activities
- Journal

Estimated Independent Study Hours per Week: 2

VII. TEXTS AND MATERIALS

A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS

Michael Hacker. Engineering and Technology. 1st ed. Delmar Cengage Learning, 2010.
 Qualifier Text: INDUSTRY STANDARD,

B. ALTERNATIVE TEXTBOOKS

C. REQUIRED SUPPLEMENTARY READINGS

D. OTHER REQUIRED MATERIALS

- Flash drive
- Supplies needed for term project

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
Course Prerequisite Engineering Technology-10 or	Sequential
Course Prerequisite Engineering Technology-10A AND	Sequential
Course Prerequisite Engineering Technology-10B or	Sequential
Course Prerequisite Engineering Technology-12 or	Sequential

Course Prerequisite Engineering Technology-12A AND	Sequential
Course Prerequisite Engineering Technology-12B or	Sequential
Course Prerequisite Computer Aided Design/Drafting-5	Sequential

B. Requisite Skills

Requisite Skills
<p>Ability to Create 2D working drawings and 3D models with CADD software and ability to interpret dimensions and tolerances on engineering drawings.</p> <p>CADD 5 - Utilize AutoCAD software to produce 2D mechanical drawings.</p> <p>ETEC 10B - Evaluate the properties, characteristics and application of materials commonly used in manufacturing.</p> <p>ETEC 12A - Produce two-dimensional drawings and three-dimensional models using Computer Aided Design and Drafting (CADD) software.</p> <p>ETEC 12 - Produce two-dimensional drawings and three-dimensional models using Computer Aided Design and Drafting (CADD) software.</p> <p>CADD 5 - Utilize AutoCAD software to create 2D drawings using geometrical construction.</p> <p>ETEC 12B - Modify features on engineering drawings and models.</p> <p>ETEC 10 - Document design ideas graphically and in writing.</p> <p>CADD 5 - Prepare drawings using orthographic projection both manually sketched and completed with AutoCAD software.</p> <p>ETEC 10A - Document design ideas graphically and in writing.</p>
<p>Ability to select appropriate materials to satisfy design requirements.</p> <p>CADD 5 - Utilize AutoCAD software to produce 2D mechanical drawings.</p> <p>ETEC 10A - Compare and contrast essential components contained in a basic mechanical system.</p> <p>ETEC 10B - Evaluate the properties, characteristics and application of materials commonly used in manufacturing.</p> <p>ETEC 12A - Compare and contrast the various steps required in the design process.</p> <p>ETEC 10 - Compare and contrast essential components contained in a basic mechanical system.</p> <p>ETEC 10B - Specify destructive and non-destructive means of testing materials commonly used in manufacturing.</p> <p>ETEC 12B - Compare and contrast manufacturing materials and production processes.</p> <p>ETEC 10A - Identify the application of commonly used mechanisms, such as levers, wheels, pulleys, screws and gears.</p> <p>ETEC 10 - Identify the application of commonly used mechanisms, such as levers, wheels, pulleys, screws and gears.</p> <p>CADD 5 - Sketch isometric drawings.</p> <p>CADD 5 - Create basic 3D drawings with AutoCAD software.</p> <p>ETEC 12 - Compare and contrast manufacturing materials and production processes.</p>

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification
--------------------------------	-----------------------------------

D. Recommended Skills

Recommended Skills

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact
--	--------------------------------------

Course created by Eric Carlson/Steve Cocca on 09/01/2008.

BOARD APPROVAL DATE: 12/15/2008

LAST BOARD APPROVAL DATE: 06/15/2020

Reviewed and Revised by: Steve Cocca

Date: 05/08/2020

20136