Course Acronym:	ETEC
Course Number:	18A
Descriptive Title:	Engineering Design and Development I
Division:	Industry and Technology
Department:	Engineering Technology
Course Disciplines:	Engineering Technology, Manufacturing 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.
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
Co-requisite:	
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	1
Hours Laboratory (per week):	2
Outside Study Hours:	2
Total Course Hours:	54
Course Units:	1.5
Grading Method:	Letter Grade only

Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	12/15/2008
Transfer UC:	Yes
Effective Date:	
General Education: ECC	
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	
Term:	
Other:	
Student Learning Outcomes:	**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. **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. **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.
Course Objectives:	1. Perform research using conventional libraries, the internet, and other resources. 2. Explain how to research a U.S. Patent. 3. Create, simulate and test basic designs using industry standard computers and software.

	4. Evaluate test results and other data for validity. 5. Interpret sketches, designs, and drawings for technical content. 6. Work independently to research, design, manufacture, test and evaluate mechanical, electronic or electromechanical assemblies.
Major Topics:	**I. SAFETY INSTRUCTION AND REVIEW TOPICS IN COMPUTER AIDED DESIGN/DRAFTING (CADD) (2 hours, Lecture)** A. Overview of hand tools and basic power tools B. Review of CADD fundamentals **II. SAFETY LAB (4 hours, Lab)** A. Power tool safety B. Hand tool safety **III. RESEARCH METHODS (4 hours, Lecture)** 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 **IV. RESEARCH METHODS (8 hours, Lab)** A. Research methods exercise B. Patent search exercise **V. PROTOTYPE DEVELOPMENT PROTOCOL (4 hours, Lecture)** A. Prototype development B. Design C. Simulation D. Rapid-Prototyping (RP) E. Construction F. Testing and evaluation **VI. PROTOTYPE DEVELOPMENT PROTOCOL (8 hours, Lab)** A. Design exercise B. Testing and evaluation exercise

	VII. CAPSTONE ENGINEERING PROJECT PROTOCOL (4 hours, Lecture) A. Daily engineering journals B. Sketches, models and drawings C. Model simulation data and project photos D. Safety, reliability and cost effectiveness **VIII. CAPSTONE ENGINEERING PROJECT PROTOCOL (8 hours, Lab)** A. Documentation exercise B. Reliability exercise **IX. CAPSTONE PROJECT CONSTRUCTION PROTOCOL (4 hours, Lecture)** A. Teamwork and delegation B. Component construction **X. CAPSTONE PROJECT CONSTRUCTION (8 hours, Lab)** A. Construction exercise B. Presentation exercise
Total Lecture Hours:	18
Total Laboratory Hours:	36
Total Hours:	54
Primary Method of Evaluation:	2) Problem solving demonstrations (computational or non-computational)
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.
Critical Thinking Assignment 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 and submit report to the instructor.
Critical Thinking Assignment 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 to the instructor for critique and evaluation.
Other Evaluation Methods:	Class Performance Completion Laboratory Reports Multiple Choice Other Exams

	Performance Exams Quizzes Term or Other Papers True/False Written Homework
Instructional Methods:	Demonstration Group Activities Guest Speakers Lab Lecture Multimedia presentations Role play/simulation
If other:	Computer simulations
Work Outside of Class:	Journal (done on a continuing basis throughout the semester) Problem solving activity Required reading Study
If Other:	
Up-To-Date Representative Textbooks:	Michael Hacker. Engineering and Technology. 1st ed. Cengage Learning, 2010. DISCIPLINE STANDARD
Alternative Textbooks:	Project Lead the Way (PLTW) handouts
Required Supplementary Readings:	
Other Required Materials:	1. Flash drive 2. Supplies needed for term project
Requisite:	Prerequisite
Category:	sequential
Requisite course(s): List both prerequisites and corequisites in this box.	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
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	**Ability to create 2D working drawings and 3D models with CADD software and ability to interpret dimensions and tolerances on engineering drawings.** ETEC 10 - Document design ideas graphically and in writing.

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

the requisite skill(s). If applicable	
Requisite course:	
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	
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Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Eric Carlson and Steve Cocca
Date:	02/22/2016
Original Board Approval Date:	12/15/2008
Last Reviewed and/or Revised by:	Steve Cocca
Date:	11/16/2021
Last Board Approval Date:	