



El Camino College
 COURSE OUTLINE OF RECORD – Official

Course Acronym:	ETEC
Course Number:	16A
Descriptive Title:	Computer Integrated Manufacturing I
Division:	Industry and Technology
Department:	Engineering Technology
Course Disciplines:	Engineering Technology, Manufacturing Technology
Catalog Description:	<p>This is the first of two courses that cover the integration of engineering technology principles and automation in manufacturing environments. The topics covered include machine tool operations, simulations and robotics.</p> <p><i>Note: The two-course sequence Engineering Technology 16A and Engineering Technology 16B is the same as Engineering Technology 16.</i></p>
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:	No
Effective Date:	
General Education: ECC	
Term:	
Other:	
CSU GE:	
Term:	

Other:	
IGETC:	
Term:	
Other:	
Student Learning Outcomes:	<p>SLO #1 Solid Modeling</p> <p>Students will measure and solid model a provided assembly.</p> <p>SLO #2 CNC Mill: Initials</p> <p>Students will program a CNC mill to engrave their initials in a block of wood.</p> <p>SLO #3 MasterCam Toolpath</p> <p>Student will create a toolpath using MasterCam from a given solid model.</p>
Course Objectives:	<ol style="list-style-type: none"> 1. Answer objective questions about machine tool safety with 100% accuracy. 2. Select appropriate cutting tools to efficiently, safely, and accurately machine parts on Computer Numerical Control (CNC) machines. 3. Calculate speeds and feeds for common machine tool operations. 4. Setup and operate CNC milling machines to perform simple operations such as milling and drilling. 5. Compare and contrast the four common types of robotic control.
Major Topics:	<p>I. Orientation and Safety (2 hours, lecture)</p> <ol style="list-style-type: none"> A. Careers in automation, manufacturing, and engineering technology B. Lab safety <p>II. Orientation and Safety (4 hours, lab)</p> <ol style="list-style-type: none"> A. Careers exercise B. Lab safety exercise <p>III. CNC Machining (10 hours, lecture)</p> <ol style="list-style-type: none"> A. Machine components, axis identification B. Measurement, speeds and feeds C. Work holding, tools and fixtures D. Setup and operation <p>IV. CNC Machining (20 hours, lab)</p> <ol style="list-style-type: none"> A. Machine setup exercise B. CNC machining exercise <p>V. CNC Programming (2 hours, lecture)</p> <ol style="list-style-type: none"> A. Tool motion B. CNC codes C. Transmitting files

	<p>VI. CNC Programming (4 hours, lab)</p> <p>A. Tool motion exercise B. CNC code exercise</p> <p>VII. Robotics (4 hours, lecture)</p> <p>A. Robotics and automated systems B. Controllers C. End effectors D. Robot applications</p> <p>VIII. Robotics (8 hours, lab)</p> <p>A. Robot programming exercise B. Robot application exercise</p>
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:	Working in teams of two, design, configure and assemble a VEX robot from standard parts. Program the robot to autonomously negotiate the VEX playing field, and report results on a one-page lab report to your instructor.
Critical Thinking Assignment 1:	Write a simple program for a 3 axis CNC vertical milling machine to drill and countersink holes, mill slots and cut a profile. Upload the program and set up the machine to produce the part. Submit the completed part to your instructor for evaluation.
Critical Thinking Assignment 2:	It has been determined that the rate of feed for a machining sequence in the middle of a program running on the CNC machining center is excessive. Determine the number of the sequence, calculate the appropriate feed rate, edit the sequence at the machine control unit and run the part to confirm that the change has corrected the problem. Submit your findings and corrective measures to your instructor on a one-page lab report.
Other Evaluation Methods:	<p>Performance Exams Other Exams Quizzes Written Homework Laboratory Reports Class Performance Term or Other Papers Multiple Choice Completion Matching Items True/False</p>
Instructional Methods:	<p>Demonstration Laboratory</p>

	Lecture Multimedia presentations
If other:	Computer simulations
Work Outside of Class:	Study Required reading Problem solving activities
If Other:	
Up-To-Date Representative Textbooks:	Michael Hacker. <u>Engineering & Technology</u> . 1st ed. Delmar Cengage Learning, 2009. (Discipline Standard)
Alternative Textbooks:	
Required Supplementary Readings:	Project Lead the Way handouts https://www.pltw.org/
Other Required Materials:	Flash drive - removable media
Requisite:	
Category:	
Requisite course(s): List both prerequisites and corequisites in this box.	
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
Date:	09/01/2005
Original Board Approval Date:	12/15/2008
Last Reviewed and/or Revised by:	Eric Carlson
Date:	03/13/2023
Last Board Approval Date:	07/17/2023 effective FALL 2024