



El Camino College  
COURSE OUTLINE OF RECORD – Official

<b>Course Acronym:</b>	CADD
<b>Course Number:</b>	7
<b>Descriptive Title:</b>	Solid Modeling, Assemblies and Two Dimensional (2D) Drawings
<b>Division:</b>	Industry and Technology
<b>Department:</b>	Computer Aided Design/Drafting
<b>Course Disciplines:</b>	Drafting
<b>Catalog Description:</b>	In this course, students create two-dimensional (2D) sketches, three-dimensional (3D) wireframe, and solid models. Models or assemblies are displayed on a 2D drawing format and orthographically projected with dimensions added. Shading, rendering, and solid model modifications are also available in the 2D mode. Auxiliary, detail, and section views are also created with the use of the place view toolbar and its commands. This course utilizes Autodesk Inventor Pro software (Inventor Pro).
<b>Prerequisite:</b>	
<b>Co-requisite:</b>	
<b>Recommended Preparation:</b>	Computer Aided Design/Drafting 5 or one year of high school drafting or industry experience
<b>Enrollment Limitation:</b>	
<b>Hours Lecture (per week):</b>	2
<b>Hours Laboratory (per week):</b>	4
<b>Outside Study Hours:</b>	4
<b>Total Course Hours:</b>	108
<b>Course Units:</b>	3
<b>Grading Method:</b>	Letter Grade only
<b>Credit Status:</b>	Credit, degree applicable
<b>Transfer CSU:</b>	Yes
<b>Effective Date:</b>	Prior to July 1992
<b>Transfer UC:</b>	Yes
<b>Effective Date:</b>	Fall 2008
<b>General Education: ECC</b>	
<b>Term:</b>	
<b>Other:</b>	
<b>CSU GE:</b>	
<b>Term:</b>	

Other:	
IGETC:	
Term:	
Other:	
<p><b>Student Learning Outcomes:</b></p>	<p><b>SLO #1 Creating Simple Machined Part-3D Solid Model</b></p> <p>Given sufficient product definition information of a simple machined part, the student will be able to utilize the AutoCad software to produce a 3D solid model of the item.</p> <p><b>SLO #2 Modifying Simple Machined Part-3D Solid Model</b></p> <p>Given a 3D solid model of a simple machined part and a dimensioned drawing defining necessary changes, the student will be able to utilize the AutoCad software to modify the 3D solid model to conform to the new requirements.</p> <p><b>SLO #3 Creating Assembly Models</b></p> <p>Given sufficient product definition information of a mechanical assembly and its components, the student will be able to utilize the AutoCad software to create 3D solid models of the individual components and bring them together into an assembly model.</p>
<p><b>Course Objectives:</b></p>	<ol style="list-style-type: none"> <li>1. Construct and manipulate 3D models using Inventor Pro modeling software.</li> <li>2. Move, rotate and scale 3D geometry using keyboard and mouse input.</li> <li>3. Convert 3D solid models to orthogonal and isometric views to carry the geometric, dimensional and other pertinent data that describe a manufactured part.</li> <li>4. Formulate solutions for commonly encountered modeling problems.</li> <li>5. Differentiate between various 3D display options.</li> <li>6. Create 2D constrained sketches.</li> <li>7. Create engineering drawings from 3D models showing standard drafting practice.</li> <li>8. Create 2D fully dimensioned orthographic drawings.</li> </ol>
<p><b>Major Topics:</b></p>	<p><b>I. BASIC FUNCTIONS OF INVENTOR PRO 3D MODELING (4 hours, lecture)</b></p> <ol style="list-style-type: none"> <li>A. Basic Inventor Pro navigation and drawing functions</li> <li>B. User coordinate system and the X, Y, Z axis</li> </ol> <p><b>II. INTRODUCTION TO INVENTOR PRO MODELING (8 hours, lab)</b></p> <ol style="list-style-type: none"> <li>A. Development of Computer geometric modeling</li> <li>B. Familiarization with 3D navigation and Inventor Pro</li> </ol> <p><b>III. AXIS, SKETCHING, EXTRUDING, WIRERAME MODELS (6 hours, lecture)</b></p> <ol style="list-style-type: none"> <li>A. Drawing and editing tools</li> <li>B. Drawing units, dimensions, and annotations</li> <li>C. Manipulating wireframe geometry in 3D space</li> </ol> <p><b>IV. AXIS AND WIREFRAME MODELING (12 hours, lab)</b></p> <ol style="list-style-type: none"> <li>A. Exercises practicing moving and rotating the modules</li> </ol>

- B. Creating wireframe models using appropriate planes and line types
- C. Introduction to layout 2D drawings using title blocks, plotting to paper and Portable Document Format (PDF) files

**V. CONSTRAINTS AND RELATIONS (6 hours, lecture)**

- A. Fully constrained geometry
- B. Display existing constraints
- C. Over constrained and driven dimensions
- D. Parametric equations

**VI. APPLYING CONSTRAINTS (12 hours, lab)**

- A. Displaying existing constraints
- B. Over constraining and driven constraints
- C. Parametric equations as applied to advanced sketches

**VII. SOLID MODELING - CONSTRUCTIVE SOLID GEOMETRY (6 hours, lecture)**

- A. Constructive solid geometry concept
- B. Boolean operations, 2D sketches and extruding
- C. Object properties and mass properties

**VIII. SOLID MODELING - CONSTRUCTIVE SOLID GEOMETRY (12 hours, lab)**

- A. Recreating earlier modeling exercises using solid primitives and Boolean operations
- B. Moving and rotating solid geometry
- C. Adding geometric features such as fillets, chamfers and holes

**IX. MULTIVIEW DRAWINGS FROM 3D MODELS (6 hours, lecture)**

- A. Orthographic drawings
- B. Drawing scale, dimensions and notes
- C. Auxiliary views, sections and creating projections
- D. 2D drawing creation
- E. Multiple drawing sheet creation
- F. Parts list creation for assemblies drawings
- G. Revision block creation and it's drawing impact
- H. Inventor I-properties drawing relationship
- I. Ballooning of assembly components

**X. MULTIVIEW DRAWINGS FROM 3D MODELS (12 hours, lab)**

- A. Creating orthographic views, auxiliary views, isometric views scaled to the drawing size and changing view properties such as Display Scale
- B. Creating a layout drawing, manipulating line types as appropriate and adding notes and dimensions

**XI. ADVANCED MODELING TOOLS AND TECHNIQUES (4 hours, lecture)**

- A. 3D symmetrical features

	<ul style="list-style-type: none"> <li>B. Shells, draft angles, and fillets</li> <li>C. Making design changes and advanced editing</li> </ul> <p><b>XII. ADVANCED MODELING TOOLS AND TECHNIQUES (8 hours, lab)</b></p> <ul style="list-style-type: none"> <li>A. Creating a 3D model using 3D symmetrical features</li> <li>B. Creating an using shell, draft angle and fillet features</li> <li>C. Editing a 3D design using grips</li> </ul> <p><b>XIII. CONCEPTUAL DESIGN TOOLS AND TECHNIQUES (4 hours, lecture)</b></p> <ul style="list-style-type: none"> <li>A. Using the edit features pull command to edit solid features</li> <li>B. Using the imprint command</li> <li>C. Material properties</li> <li>D. Creating circular patterns</li> <li>E. Sweep path creation</li> <li>F. Mirror features</li> </ul> <p><b>XIV. CONCEPTUAL DESIGN TOOLS AND TECHNIQUES (8 hours, lab)</b></p> <ul style="list-style-type: none"> <li>A. Creating a conceptual model using push/pull extrusion techniques to both create solid features and to subtract holes</li> <li>B. Sketching on a 3D solid model using the IMPRINT command</li> </ul>
<b>Total Lecture Hours:</b>	36
<b>Total Laboratory Hours:</b>	72
<b>Total Hours:</b>	108
<b>Primary Method of Evaluation:</b>	2) Problem solving demonstrations (computational or non-computational)
<b>Typical Assignment Using Primary Method of Evaluation:</b>	Using Inventor Pro software, create 3D models of c-clamp parts and assembly. Print a 2D drawing of c-clamp and submit to the instructor.
<b>Critical Thinking Assignment 1:</b>	From design sketches provided by the instructor for a cellular phone case, produce a 3D model on Inventor Pro software using parametric modeling techniques. Print a 2D drawing of cellular phone case and submit to the instructor.
<b>Critical Thinking Assignment 2:</b>	Access the file name "KDK Tool Holder" in the student training directory. Using Inventor Pro software, modify the dovetail joint on the solid model of the base as indicated on the change specification. Calculate the clearance needed for the sliding fit and design the mating tool holder on the solid model. Print a 2D drawing of tool holder design and submit to the instructor.
<b>Other Evaluation Methods:</b>	<ul style="list-style-type: none"> <li>Class Performance</li> <li>Performance Exams</li> <li>True/False</li> <li>Quizzes</li> <li>Homework Problems</li> <li>Multiple Choice</li> <li>Matching Items</li> </ul>

<b>Instructional Methods:</b>	Discussion Group Activities Guest Speakers Internet Presentation/Resources Lecture Multimedia Presentations Simulation
<b>If other:</b>	
<b>Work Outside of Class:</b>	Study  Required reading  Problem solving activities  Written work
<b>If Other:</b>	
<b>Up-To-Date Representative Textbooks:</b>	Randy H. Shih. <u>PARAMETRIC MODELING AUTODESK INVENTOR 2022</u> . SDC Publications, 2021
<b>Alternative Textbooks:</b>	
<b>Required Supplementary Readings:</b>	
<b>Other Required Materials:</b>	Flash Drive (1 GB minimum)  3 Ring Binder
<b>Requisite:</b>	
<b>Category:</b>	
<b>Requisite course(s): List both prerequisites and corequisites in this box.</b>	
<b>Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).</b>	
<b>Requisite Skill:</b>	
<b>Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable</b>	
<b>Requisite course:</b>	Computer Aided Design/Drafting-5
<b>Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course</b>	<b>Possess basic drafting skills such as orthographic projection hand sketch creation.</b>  CADD 5 - Prepare drawings using orthographic projection both manually sketched and completed with AutoCAD software.

<b>objective under each skill(s).</b>	<p><b>Utilize isometric view hand sketch creation.</b></p> <p>CADD 5 - Sketch isometric drawings.</p> <p><b>Basic understanding of dimensioning and tolerance practice.</b></p> <p>CADD 5 - Utilize correct dimensioning practices on orthographic projection drawings.</p>
<b>Requisite Skill:</b>	or one year of high school drafting or industry experience
<b>Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable</b>	If students have not taken Computer Aided Design/Drafting 5 but possess basic drafting skills from working in the manufacturing field or have taken basic drafting in high school, these students will be prepared to take this course. If students have knowledge of basic drafting, their success in this course will be enhanced.
<b>Enrollment Limitations and Category:</b>	
<b>Enrollment Limitations Impact:</b>	
<b>Course Created by:</b>	George Miles
<b>Date:</b>	09/01/1990
<b>Original Board Approval Date:</b>	
<b>Last Reviewed and/or Revised by:</b>	Vince Phamdo
<b>Date:</b>	03/14/2023
<b>Last Board Approval Date:</b>	07/17/2023 effective FALL 2024