

ENGR 130: ENGINEERING GRAPHICS

Citrus College Course Outline of Record

| Heading | Value |
|-------------------------------|---------------------------------|
| Effective Term: | Fall 2023 |
| Credits: | 4 |
| Total Contact Hours: | 144 |
| Lecture Hours : | 36 |
| Lab Hours: | 108 |
| Hours Arranged: | 0 |
| Outside of Class Hours: | 72 |
| Total Student Learning Hours: | 216 |
| Prerequisite: | MATH 144 or higher or AUTO 295. |
| Strongly Recommended: | ENGL 101. |
| Transferable to CSU: | Yes |
| Transferable to UC: | Yes - Approved |
| Grading Method: | Standard Letter |

Catalog Course Description

2D and 3D Computer-aided design (CAD) for students seeking to enter the engineering and engineering technology fields. This course covers the principles of engineering drawing and sketching for mechanical design, the use of computer graphics and solid modeling in design representation of 3D objects along with assemblies and simulations as well as ASME standards on geometric dimensioning and tolerances. 36 lecture hours, 108 lab hours.

Course Objectives

- Prepare engineering drawings using a CAD platform for 2D and 3D drawings.
- Apply proper dimensioning techniques using CAD.
- Calculate interference or clearance fits required for assembly designs.
- Insert text and data in drawings.
- Demonstrate the application of design features such as extrusions, radius and fillets and cuts.
- Perform necessary dimension, clearance or interference calculations for designs.
- Develop a 3D model of an existing product based in direct measurement.
- Develop a portfolio of detailed part and assembly drawings.

Major Course Content

1. Introduction to engineering CAD
 - a. Industry expectations and requirements
 - b. Engineering design process
 - i. Determining design type
 - ii. Interpreting model and drawing attributes
 - c. Methods and technologies
 - i. 2D and 3D modeling comparisons
 - ii. Engineering tools and software
2. Dimensioning and Tolerancing

- a. Standard conventions
 - i. Dimensioning conventions
 - ii. Symbols and schematics
 - iii. Call out and labeling conventions
- b. Fitments
 - i. Clearance fit
 - ii. Interference fit
- c. Working Drawings
 - i. 2D drawing interpretations
 - ii. 3D drawing interpretations
 - iii. Bill of material
3. 2D CAD modeling and labeling
 - a. Multi-view sketches
 - b. Pictorial sketches
 - c. Geometry and constraints
 - d. Engineering drawing templates
4. 3D CAD modeling and labeling
 - a. Solid modeling
 - b. Geometry and constraints
 - c. Auxiliary views
 - d. Section views
 - e. Engineering drawing templates
5. Introduction to finite element analysis (FEA)
 - a. Mathematical basis of FEA
 - i. Node and meshing concepts
 - ii. Applications of linear equations
 - b. Software applications
 - i. Meshing and node creation
 - ii. Thermal and stress analysis applications
6. Technical presentations
 - a. Presentation of engineering drawings in professional settings
 - i. Methods of presenting drawings in industry
 - ii. Team engineering projects

Lab Content

1. Introduction to SolidWorks
 - a. SolidWorks parts, view manipulation, dimensions and relationships
 - b. SolidWorks snaps, grips, zoom and draw commands
2. CAD Modeling Techniques
 - a. Prepare one-view drawing with arcs, center-lines and hidden lines
 - b. Extrusion process, fillets and radius
 - c. Revolves and sweeps
3. Assemblies
4. Performing engineering design calculations
 - a. Tolerance calculations
 - b. Interference fit calculations
 - c. Clearance fit calculations
5. Finite element analysis (FEA) applications
 - a. Meshing and applying FEA software add-on
 - b. Creating thermal and stress analysis drawings using FEA
6. CAD applications to additive and subtractive manufacturing

- a. Using G-code software add-on to prepare drawing for 3D printing
- b. Using G-code software add-on to prepare drawing for computer-numerically-controlled (CNC) machining

Suggested Reading Other Than Required Textbook

Solidworks website articles, ASME Engineering Magazine articles and website articles from ManufacturingTomorrow.com

Examples of Required Writing Assignments

Visit Solidworks.com and select new products. Write a one page summary about the enhancements and functionality offered in SOLIDWORKS 2021 that will bring better-designed products to market faster.

Examples of Outside Assignments

Chapter Review Questions: Interpret the type and size of a fastener from the given specifications. Write the size and type. Practical Exercises: From the given pictorial drawing, prepare a set of multi-view drawings with dimensions using CAD.

Instruction Type(s)

Lab, Lecture, Online Education Lecture