TAFTCOLLEGE

Reviewed by: P. Blake
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Date Reviewed: Spring 2022
Textbook update: Spring 2022
C & GE Update: April 21, 2022
Board approved: May 11, 2022
Semester effective:

Engineering (ENGR) 1510 Engineering Graphics and Introduction to Design with Lab (3 Units) CSU: UC

Prerequisite: Successful completion of Math 1530 Plane Trigonometry with a grade of 'C' or better

Prerequisite knowledge/skills: Before entering the course the student should be able to:

1. Identify special triangles and their related angle and side measures;
2. Evaluate the trigonometric function of an angle in degree and radian measure;
3. Manipulate and simplify a trigonometric expression;
4. Solve trigonometric equations, triangles, and applications;
5. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs;
6. Evaluate and graph inverse trigonometric functions;
7. Prove trigonometric identities;
8. Convert between polar and rectangular coordinates and equations;
9. Graph polar equations;
10. Calculate powers and roots of complex numbers using DeMoivre's Theorem, and
11. Represent a vector (a quantity with magnitude and direction) in the form and ai+bj.

Advisory: Eligibility for English 1500 or 1501 strongly recommended

Hours and Unit Calculations:
32 hours lecture. 64 Outside-of-class hours. 48 hours lab; (112 Total Student Learning Hours) 3 Units

Catalog Description: This course covers the principles of developing engineering 3D designs and 2D drawings including proper design, dimension and visualization techniques. Topics include the engineering design process and the development of skills to create and properly use part and assembly relationships, visualization skills, orthographic projections and mechanical dimensioning and tolerancing practices. The use of CAD software, 3D printing and plotting is an integral part of the course. C-ID: ENGR 150

Type of Class/Course: Transfer Degree Credit

Textbook:
Shih, Randy H. *Autodesk Inventor 2020 and Engineering Graphics: An Integrated Approach;* SDC Publications, 2019.

Lab Manual: Sorby, Sheryl. *Developing Spatial Thinking.* Higher Education Services. 2016

Course Objectives:

By the end of the course a successful student will be able to:

1. Apply the engineering design process to a design project,
2. Use CAD software to create:
    - 3 Dimensional (3D) models and assemblies
    - 2 Dimensional (2D) engineering part and assembly drawings,
3. Apply rules of orthographic projection to create multi-view drawings,
4. Create pictorials from orthographic views,
5. Create auxiliary and section views of an object following correct conventions, and
6. Apply standards of dimensioning and tolerancing to engineering drawings.

Course Scope and Content (Lecture):

Unit I — Engineering Design
- A. Principles of Design
- B. Types and Tradeoff Decisions
- C. Designing in 3D

Unit II — Basic Engineering Drawing Concepts and Types
- A. Detail, Assembly, Manufacturing Process
- B. Format, ANSI (American National Standard Institute) Standards
- C. Other drawing types: Process, Schematic, Architectural

Unit III — Visualization skills
- A. Conceptualization
- B. Sketching

Unit IV — 3D Solid Modeling
- A. Viewing Concepts
- B. Geometry Creation Options
- C. Solids and Surfaces
- D. Parametric Dimensions
- E. Linking with Computer Aided Manufacturing (CAM) and Engineering Analysis

Unit V — 2D Drawing Generation
- A. Detail and Assembly
- B. Electronic vs. physical drawing
- C. Drawing Management
- D. Bills of Material (BOM's)

Unit VI — Views
- A. Multi-view – purpose and projections
- B. Line Types – object, hidden, center, break
- C. Auxiliary Views – purpose and type
- D. Section Views - Purpose and Types

Unit VII — Scales
- A. Purpose in engineering and architect
- B. Typical Factors
- C. Callouts

Unit VIII — Dimensioning & Tolerancing

A. ANSI Standards
B. Lines, positions, size
C. Three Techniques
D. GD&T (Geometric Design & Tolerances)

Unit IX Fasteners & Welding
A. Types and Purposes
B. Symbols
C. Drill Callouts

Course Scope and Content (Laboratory):

Unit I Starting CAD System
A. Basic Commands
B. Coordinates & Views
C. Toolbars and Menus
D. Units of Measure and Scale
E. Help

Unit II 3D Modeling
A. Coordinate Systems
B. Viewpoints
C. Sketching
D. Geometry Creation
E. Parametric Dimensioning
F. Part Assemblies
G. Types: solid, wireframe, surface

Unit III Viewing Commands
A. Pan
B. Zoom
C. Scroll
D. Views

Unit IV Drawing Creation
A. Automatic Generation
B. View Placement
C. Title Block and Format

Unit V Edit
A. Selection Sets
B. Erase
C. Copy, Mirror, Move, Offset, Array
D. Trim, Fillet, Break, Lengthen

Unit VI Organize
A. Layers & Line types
B. Colors
C. Blocks

Unit VII Text and Hatch

A. Style
B. Justification
C. Edit
D. Patterns
E. Areas

Unit VIII Dimensioning
A. Types (linear, radial, angular, ordinate)
B. Edit
C. Tolerancing

Unit IX Getting Information
A. Lists
B. Measure
C. Locations
D. Volumes, Areas and Perimeters

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 4 hours per week outside of the regular class time doing the following:

1. Studying assigned text, handout materials and class notes
2. Reviewing and preparing for quizzes, midterm and final exams
3. Completing individual projects using the CAD software including sketches, models, drawings, assemblies and assembly drawings

Methods of Instruction:

1. Lecture, demonstrations and discussions
2. Individual projects with emphasis on hands-on work by applying lecture principles on the CAD system software
3. Group projects with emphasis on design creativity, problem solving and teamwork

Methods of Evaluation:

1. Quizzes
2. Exams
3. Participation
4. Individual and group assignments & projects
5. Oral presentations
6. Design project

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab.
1. Curriculum development for each lab.
2. Published schedule of individual laboratory activities.
3. Published laboratory activity objectives.
4. Published methods of evaluation.

5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies.

During laboratory activity of the laboratory: All of the following criteria are met by this lab.
1. Instructor is physically present in lab when students are performing lab activities.
2. Instructor is responsible for active facilitation of laboratory learning.
3. Instructor is responsible for active delivery of curriculum.
4. Instructor is required for safety and mentoring of lab activities.
5. Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is responsible for personal evaluation of significant student outcomes (lab exercises, exams, practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course.
2. Instructor is responsible for supervision of laboratory clean up of equipment and materials.

Supplemental Data:

TOP Code:	090100: Engineering, General (requires
SAM Priority Code:	E: Non-Occupational
Distance Education:	Not Applicable
Funding Agency:	Y: Not Applicable(funds not used)
Program Status:	1: Program Applicable
Noncredit Category:	Y: Not Applicable, Credit Course
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Course is not a basic skills course
Prior to College Level:	Y: Not applicable
Cooperative Work Experience:	N: Is not part of a cooperative work experience education program

Eligible for Credit by Exam:	E: Credit By Exam
Eligible for Pass/No Pass:	NO
Taft College General Education:	NONE
Discipline:	Engineering