1. Course title:

Engineering Graphics and Design II

2. Prerequisite:

a) ENGR 1211 with grade of C or higher
b) Math 1113 (Pre-calculus) with a C or better.

3. Textbook:


4. Catalog Description:

A continuation of ENGR 1211, this course introduces the principles of computer-assisted graphics and engineering design, with emphasis on the fundamentals of the design process. This course integrates the creation of multi-view and orthographic drawings with freehand sketching and two- and three-dimensional modeling techniques, using industry standard computer-assisted graphics and design software. Orthographic and isometric projections, auxiliary and section views, dimensioning and tolerancing practices, holes, gears and threaded fasteners are presented, focusing on engineering models and manufacturing processes.

5. Course objective:

As a result of completing this course, the student will be able to do the following:

1. Describe various areas of engineering in which graphics are an important mode of communication.
2. Identify the steps in the engineering design process.
3. Understand the elements of three-dimensional visualization and good sketching techniques.
   a. Prepare elementary sketches of three dimensional objects with the correct interpretation of three-dimensional geometry.
   b. Understand and interpret a sketch.
4. Read and understand the basic structure and content of engineering drawings.
   a. Draw multiview orthographic and other projections including isometric, sectional and auxiliary drawings.
   b. Use computer-aided design software for basic two-dimensional and three-dimensional drafting applications.
   c. Understand and correctly use common drawing notations.

5. Understand elementary modeling and visualization.
   a. Generate parametric, feature-based solid models from two-dimensional representations.
   b. Generate parametric models of three-dimensional solid entities and structures.
   c. Generate two-dimensional views of three-dimensional solids.
   d. Build assemblies using generated parametric three-dimensional models.
   e. Perform simple analyses of simple three-dimensional models, assemblies and structures.

6. Apply the steps of the engineering design process to a specific problem in a group setting.

6. General notes:
   a) This is not a drafting course. Although students will learn the principles of representation by application, the emphasis of the course is always on the principles of projection. The graphical ability to produce, interpret and communicate ideas is the desired result of this course.
   b) A team engineering design project is required and should begin no later than the midpoint of the course. This allows the instructor an opportunity to evaluate the students and create balanced design teams of at most three students. The teams should be encouraged to design solutions to problems of their own experience. If any team does not formulate their own project, then design problems in the supplement section of several chapters in the text may be used. It is recommended however that the instructor push students toward design issues in current and emerging areas of technical interest. These problems may also be modified before selection by the team with prior permission of the instructor. Students should be given some class time for completing their project.
   c) The principles of graphical representation should be reviewed and practiced by freehand sketching. Techniques of using computer-assisted drawing should be included progressively so that the students work primarily with this software.
   d) Students should be required to have access to quadrille ruled paper and isometric ruled paper, a mobile storage device, pencils HB or #2 and a good quality eraser.
   e) Advisors are expected to review of the essentials for draw, edit, text, dimensioning and printing commands of Autodesk both by examples and additional notes/handouts/online resources.
7. Course Outline:

Review the following:

a) The engineering design process: Chapter 2 all sections.

b) Design in Industry: Chapter 3.1 – 3.8 (Present a design problem from Chapter 4).

c) The Role of Technical Graphics in Production and manufacturing processes: Chapter 5 all sections

d) Design Visualization: Chapter 6

e) Sketching and text: Chapter 8 sections 7.6-7.9, 7.11

f) 3D Modeling: Chapter 9 all sections with Inventor instructions***

g) Multi-view drawings: Review Chapter 10 all sections with design/project focus and Inventor instructions***

h) Axonometric and oblique drawings: Review Chapter 11 sections 11.1 and 11.2 with design/project focus and Inventor instructions***

i) Auxiliary views: Chapter 12 sections 13.1 and 2 with design/project focus and Inventor instructions***

j) Section views: Chapter 13 all sections with design/project focus and Inventor instructions***

k) Dimensioning and Tolerancing practices: Chapter 14 sections 17.1-17.8 and Inventor instructions***

l) Geometric Dimensioning and Tolerancing: Chapter 15 all sections (optional but recommended)

m) Fastening Devices and Methods: Chapter 16 and Inventor instructions***


o) Mechanisms: Gears, Cams, Bearings, and Linkages: Chapter 18 all sections

*** Please see a teaching guide for Textbook #2 for chapters need to be covered for Inventor instructions.

8. Evaluation:

Recommended weights for the four components are as follows:

a) Classwork/Homework: 10%-15%

b) At least three in-class assessments (tests or quizzes) : 30%

c) Two design projects: 30%

d) A comprehensive final examination: 25-30%
The project should be evaluated based on the following factors:

Problem statement, preliminary ideas, part models and assemblies for the final design, isometric and pictorial drawings for the assembled product and orthographic views with dimensions for each component (fasteners and small parts need not be included) using Autodesk Suite.

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