Department of Mechanical Engineering
FED 101 ME – Fundamentals Engineering Design 101
Required

FED-101 ME (2 1 2)

Catalog Description:

Study technical graphics and the computer as a technical drawing tool. Introduces projections and multiview drawings and visualization. Discuss geometry commonly used in engineering design graphics, orthographic projections, dimensioning techniques, tolerancing and introduction to auxiliary and sectional views. Apply software program Pro/ENGINEER to various problems.

Co-requisites: HSS 100 in the spring or HSS 101 in the fall.

Textbook(s) Materials Required:

1. **Fundamentals of Graphics Communication, 5th Edition**, Bertoline *et al*, WCB/McGraw-Hill, 2006.
2. **Pro/ENGINEER Tutorial Wildfire 2.0**
   Tutorial and Multimedia CD by Roger Toogood, SDC Publications.

Reference(s) (Not Required):

1. **The Engineering Design Process, Second Edition,** Ertas *et al*, John Wiley & Sons, 1996.
   Chapter 10– ENGINEERING ETHICS (p. 427 – 468)

Commercial Software Packages:

1. Pro/ENGINEER by PTC Inc.

Course Supervisor: Dr. Herli Surjanhata

Pre-requisite by topic

None

Course Objectives[1]:

1. To provide the student with some knowledge or understanding of the design process and technical graphics used in the design process. (A, B, D, E)
2. To develop the student's skills in reading, constructing and understand basic mechanical engineering drawings. (A, B, D, E)
3. To develop the student's skills in using modern CAD software to generate solid models, assembly, and detailed drawings. (A, B, D, E)

Topics[2] :

1. Introduction - design process & technical graphics used in the design process. ENGINEERING ETHICS – Hand-out and review overview of traditional drawing tools: pencils, compass, triangles, and etc. ANSI Standard Sheet Sizes and Title Blocks and Borders. (1 hr)
   CAD: Computer as technical drawing tool; Pro/ENGINEER as a solid modeling software package.
2. Alphabet of Lines; line drawing techniques; scales; hand and CAD Lettering a technical drawing; freehand sketching techniques; coordinate space, classification of geometric elements and construction; and 3-D Modeling. (1 hr)
   Pro/ENGINEER: Creating a simple object Part I.
3. Engineering geometry, introduction to projections – multiview, isometric (one type of axonometric), oblique, and perspective. (1 hr)
   Pro/ENGINEER: Creating a simple object Part II (Hole, Chamfer, Round etc.), Implementing design intent using relations (simple equations).
4. Visualizing a multiview drawing; the Six Principal Views – First and Third angle projections; Multiview sketching; Multiviews from 3-D CAD Models. (1 hr)
   Pro/ENGINEER: Revolved protrusions, mirror copies, model analysis.
5. View selection; Fundamental views of edges and planes for visualization. (1 hr)
   Pro/ENGINEER: Obtaining information about the model; suppressing and resuming features; modifying feature definitions; insert mode.
6. Multiview Representation for Sketches; ANSI Standards for Multiview Drawings and Sketches. (1 hr)
   Pro/ENGINEER: Sketcher Tools and Datum Planes.
7. Visualization for design, multiview drawing visualization. Dimensioning, size and location dimensions, detail dimensioning & dimensioning techniques. (1 hr)
   Pro/ENGINEER: Patterns and Copies.
8. Auxiliary View projection theory, classifications, applications. Auxiliary view in CAD. (1 hr)
   Pro/ENGINEER: Engineering Drawings.
9. Pictorial Projections – Axonometric Projections (Isometric, Dimetric and Trimetric); Oblique Projections; Perspective Projections. Section views in isometric drawings and isometric assembly drawings. (1 hr)
   Pro/ENGINEER: Engineering drawings (Continued …)
10. Section Views – sectioning basics, section view types and special sectioning conventions, section views using 3-D CAD techniques. (1 hr)
    Pro/ENGINEER: Engineering Drawings (Continued …)
11. Tolerancing – Interchangeability. Tolerance representation and tolerances in CAD. (1 hr)
    Pro/ENGINEER: Assembly Fundamentals and Constraints; Assembly Operations (Information, Part Modifications, Exploding Assembly, Create Sections etc.)
12. Working drawings and assemblies – basic concepts; working drawings; part lists etc. Using CAD to create production assembly drawings. (1 hr)
    Pro/ENGINEER: Assembly drawings, sweep and blend.

13. Hands on experience using available software through various parts creation – Lectures on particular exercise are in depth and demonstrations are given. Final project includes technical report writing and oral presentation with PowerPoint (29 hrs in total spreading in the 14 weeks semester).

Evaluation Method:

1. **Exam**
2. **Homework**
3. **Project – Technical report and oral presentation**

Schedule: Lecture: 2 hours, per week
Laboratory: 1 hours, per week

Professional Component: Engineering Science and Design

Program Objectives Addressed: A, B, D, E

Course Outcomes[3] :

Objective 1

1.1 Student will demonstrate an understanding of engineering design process and the role technical graphics and CAD play. (o) (a, g, i, j, k)

1.2 Students will do oral presentation for their final project using modern media communication tools. (o) (a, g, i, j, k)

Objective 2

2.1 Student will demonstrate ability to construct third angle projection layout of orthographic drawings from given pictorial views using CAD software. (o) (a, g, i, j, k)

2.2 Student will practice free hand sketch of orthographic and pictorial views as part of design process. (o) (a, g, i, j, k)

Objective 3

3.1 Students will demonstrate an ability to generate 3-D solid parts in CAD software by extrusion, revolving, blending, sweeping. (o) (a, g, i, j, k)

3.2 Students will demonstrate an ability to create an assembly of many component parts. (o) (a, g, i, j, k)

3.3 Students will demonstrate an ability to generate detailed drawings of various parts. (o) (a, g, i, j, k)

3.4 Student will use modern CAD software to do assignments including project. (o) (a, g, i, j, k)

Prepared by: Herli Surjanhata **Date: September 30, 2006**

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[1] Capital Letters in parenthesis refer to the Program Objectives of the Mechanical Engineering Department. Listed in Sec 2 d Tables B-2-9, B-2-12. Table B-2-8 links Program Objectives with the ABET a-k Criterion.

[2] Topi**c** numbers in parenthesis refer to lecture hours. (three hours is equivalent to 1 week)

[3] Outcome numbers in parenthesis refer to evaluation methods used to assess the student performance. Lower case letters in parenthesis refer to ABET a-k outcomes.