Las Positas College
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Course Outline for DSNT 70

MANUFACTURING AND DESGN USING PRO/ENGINEER

Effective: Fall 2002

I. CATALOG DESCRIPTION:
DSNT 70 — MANUFACTURING AND DESGN USING PRO/ENGINEER — 3.00 units

Fundamentals of computer-aided design and drafting using Pro/ENGINEER software, a 3-D solid modeler. Application of operating system, software, hardware, and peripherals in creating manufacturing models.

2.00 Units Lecture 1.00 Units Lab

Prerequisite
-
or

DSNT 52 - Technical Graphics
with a minimum grade of C

Strongly Recommended
DSNT 66A - Mechanical Design Concepts

Grading Methods:
Letter Grade

Discipline:

	MIN
Lecture Hours:	36.00
Lab Hours:	54.00
Total Hours:	90.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 3

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. DSNT52
1. list and describe 3-D (three-dimensional) modeling and analysis techniques used in design;
2. identify the traditional tools and associated terms used to create technical drawings;
3. identify and explain the function of the primary components of a CAD system;
4. demonstrate correct hand and CAD-lettering practices as well as knowledge of linetypes;
5. understand the importance of sketching and how it integrates into the design process;
6. develop visualization skills to clearly represent and control mental images;
7. explain and construct geometry and geometric conditions that occur between entities;
8. precisely maneuver in coordinate space within 2-D and 3-D coordinate systems;
9. create and edit multiview drawings using hand tools or CAD, solving elementary design problems;
10. use fundamental descriptive and spacial geometry methods to analyze graphic models;
11. apply cutting planes to create section views using conventional practices;
12. apply standard dimensioning and tolerancing notations to mechanical drawings;
13. identify and draw geometric dimensioning and tolerancing symbols;
14. develop a basic understanding of fastening devices, manufacturing tools, production processes, and their effects on the finished product;
15. describe how working drawings provide data to make part or assembly of final design;

Before entering this course, it is strongly recommended that the student should be able to:

A. DSNT66A
1. visualize, sketch, and draw detail parts of assemblies using symbols and concepts;
2. recognize the significance of 2-D and 3-D CAD integration into design process, design intent and geometric problem-solving;
3. apply visualization by solids and surfaces to analyze and accurately display multiview drawings with complex limiting elements, hidden features, and intersecting cylinders and planes;
4. utilize technical mathematics to solve geometry problems related to the design;
5. apply descriptive geometry solutions to three-dimensional problems;

6. identify the basic conditions for plane representation and projection;
7. differentiate between precision and accuracy while acquiring knowledge of tolerancing;
8. become familiar with geometric controls and tolerancing rules, symbology, and modifiers;
9. develop an understanding of datums and datum systems;
10. apply knowledge of manufacturing practices, industrial materials, instrumentation, and fabrication specifications to the design of castings, forgings, sheet metal, weldments, and machined parts;
11. develop complex mechanical detail drawings with computer-aided design system.

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. use NT operating system;
B. use Pro/E parametric feature-based design software;
C. model designs with a 3-D solid modeler;
D. know the Pro/E Sketcher;
E. create basic and construction features;
F. create complex shapes;
G. redefine the features (making engineering changes).

V. CONTENT:

A. Components of computer graphics system
    1. General description
    2. Advantages
B. NT system operation
    1. Operating system (Windows NT) and applications
    2. Command structure
    3. Symbols, characters, punctuation, and keyboard
    4. Utility routines: file, save, retrieve
C. Working in the Pro/ENGINEER environment
    1. Introduction
    2. Starting Pro/ENGINEER
    3. Pro/ENGINEER Windows
    4. Modes
    5. Multiple graphic windows
    6. View orientation commands
    7. Saving views
    8. View control commands
    9. Managing files
D. Building parts
    1. Introduction
    2. Beginning a part
    3. Setting up Datum Planes
    4. Selecting geometry
    5. Choosing features
    6. Using protrusions
    7. Using extruded cut
    8. Using revolved cut
    9. Using revolved protrusion
    10. Feature numbers
    11. Parent/child relationships
E. Understanding the Sketcher
    1. Introduction
    2. What are sections?
    3. Sketcher methodology
    4. Saving a section
    5. Sketcher commands
    6. Commands for creating geometry
    7. Commands that modify geometry
    8. Commands that constrain geometry
    9. Sketcher assumptions
    10. Understanding regeneration failures
F. Construction and work management tools
    1. Introduction
    2. Datum features
    3. Datum coordinate systems
    4. Summary of datum features
    5. View enhancements-cosmetic views
    6. Environment settings for views
    7. Parametric view behavior
    8. View management review
G. Designing a part with a complex shape
    1. Introduction
    2. Basic part methodology
    3. Starting a molded part
    4. Shaping the molded part
    5. Shelling and molded parts
    6. Adding features
    7. Rounding edges
    8. Using text in features
    9. Blended protrusions
    10. Sweeps and trajectories
    11. Layers
H. Changing your design
    1. Introduction
    2. Which commands to use
    3. Deleting features
    4. Suppressing features
    5. Resuming features
    6. Reordering features

7. Changing features
8. Modifying features
9. Redefining features
10. Rerouting features
11. Regeneration failures

I. Plotting
1. Introduction
2. Plotting configuration
3. Wireframe plot creation
4. Shaded plot creation

VI. METHODS OF INSTRUCTION:
A. **Lecture** - Lecture to present concepts
B. **Discussion** - Discussion and team problem solving
C. Hands-on interactive tasks of modeling designs

VII. TYPICAL ASSIGNMENTS:
A. Problem solving or performance of lab projects and lessons: 1. Establish a well-defined mathematical (computer) model of the desired and useful engineering shapes, similar to sculpting shapes out of a clay block. Determine design intent so that future engineering changes can be easily implemented. Do Lesson # 3 (Lamit, pg. L 3-1), selecting the best series of protrusions and linear cuts which result in a final model shape of a bracket. This mathematical model is then used later in the semester to "automatically" make engineering drawings of the part. 2. Workbook Assignment: Use more advanced modeling techniques to allow construction of complex shapes. Do Lesson # 7 (Lamit, pg. 7-1) modeling a coupling by using a revolved protrusion as well as revolved cuts to construct a flanged coupling. A keyway slot and several holes must be added and patterned around the flange as well. B. Reading/Discussion: 1. Typical Topic: "Parent-child" Relationships (Lamit, pg. 111) Discuss in your own words parent-child relationships in terms of parametric design.

VIII. EVALUATION:
A. **Methods**

B. **Frequency**

1. Frequency:
a. Project assignments for each class session
b. One midterm examination
c. One final examination

IX. TYPICAL TEXTS:
1. Lamit, Gary *Basic Pro/ENGINEER 2000i².*, Brooks Cole/Thompson Learning, 2000.
2. Lamit, Gary and Kitto, Kathleen *Engineering Graphics and Design.*, West Publishing Company (ITP/Delmar), 1997.

X. OTHER MATERIALS REQUIRED OF STUDENTS:
A. Two 3½ inch computer diskettes
B. Computer use certificate