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**Course Outline for DSNT 52**

**TECHNICAL GRAPHICS**

**Effective: Fall 2002**

I. CATALOG DESCRIPTION:
DSNT 52 — TECHNICAL GRAPHICS — 3.00 units

A general approach to graphical communication and technical problem solving using sketches, traditional tools, and Computer Aided Drafting (CAD). Introduction to the concepts and skills needed to graphically represent technical design data. Emphasis is on the development of visualization techniques and understanding design process as the foundation of the Design Technology sequence.

1.50 Units Lecture 1.50 Units Lab

**Grading Methods:**
Letter or P/NP

**Discipline:**

| | MIN |
|---|---|
| **Lecture Hours:** | 27.00 |
| **Lab Hours:** | 81.00 |
| **Total Hours:** | 108.00 |

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

IV. MEASURABLE OBJECTIVES:

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

A. describe engineering design process and concurrent engineering design approach;
B. list and describe 3-D (three-dimensional) modeling and analysis techniques used in design;
C. identify the traditional tools and associated terms used to create technical drawings;
D. identify and explain the function of the primary components of a CAD system;
E. demonstrate correct hand and CAD-lettering practices as well as knowledge of linetypes;
F. understand the importance of sketching and how it integrates into the design process;
G. develop visualization skills to clearly represent and control mental images;
H. explain and construct geometry and geometric conditions that occur between entities;
I. precisely maneuver in coordinate space within 2-D and 3-D coordinate systems;
J. create and edit multiview drawings using hand tools or CAD, solving elementary design problems;
K. create an isometric and/or oblique drawing or sketch;
L. explain auxiliary view projection theory and create auxiliary views of inclined planes;
M. use fundamental descriptive and spacial geometry methods to analyze graphic models;
N. apply cutting planes to create section views using conventional practices;
O. apply standard dimensioning and tolerancing notations to mechanical drawings;
P. identify and draw geometric dimensioning and tolerancing symbols;
Q. develop a basic understanding of fastening devices, manufacturing tools, production processes, and their effects on the finished product;
R. describe how working drawings provide data to make part or assembly of final design;
S. describe possible career paths in Design Technology and initiate résumé preparation.

V. CONTENT:
A. Introduction to Graphics Communication
1. Importance of Technical Graphics
2. History of Graphic Communications
3. Changes in Engineering Design process and the role of graphics
a. Concurrent Engineering and Design for Manufacturability (DFM)
b. Modeling and Analysis techniques used in design
4. Standards and conventional practices
5. Technical Drawing Tools
a. Traditional Drawing Tools
1. Use of straightedge, mechanical pencil, protractor, triangles
2. Use of scales, compass, dividers, templates
3. Drawing layout, format, media
b. Computer-Aided Drawing Tools-typical microcomputer system components

6. Lettering Standards for freehand and computer generated lettering
7. Alphabet of Lines and line drawing techniques

B. Visualization Techniques for Design
   1. Technical Sketching
      a. Freehand and CAD sketching tools
      b. Purpose of sketching and importance as preparatory activity for CAD
      c. Evaluation of line quality, proportion, and shape description
      d. Freehand and CAD sketching techniques
      e. Introduction to Projections
   2. Developing visualization skills
      a. Manipulation of solid primitives for visualizing 3-D objects
      b. Use of image planes and projection
      c. Role of color, shading and shearing
      d. Use of computer graphics

C. Construction of 2-D and 3-D geometry using traditional methods and CAD
   1. Geometric Construction techniques
      a. Cartesian Coordinate System
      b. Geometric elements and relationships
      c. Constructing conditions between entities
   2. Three-Dimensional Modeling
      a. Overview of 3-D modeling theory
      b. Common construction techniques- wireframe, surface, and solid
      c. Applications in Industry
   3. Multiview Projection and Drawing
      a. Orthographic projection and multiview projection planes
      b. Space dimensions and system of principle views
      c. View selection, placement, and analysis of planes
      d. Multiview representations
   4. Axonometric and Oblique Drawing
      a.
         1. Isometric, dimetric, and trimetric projections
         2. Oblique projection theory, classification, and construction
   5. Perspective Drawing Theory
   6. Auxiliary Views
      a. Auxiliary view projection theory
      b. Auxiliary view classifications
      c. Constructing a primary auxiliary view
   7. Fundamentals of Descriptive Geometry
      a. Use of Reference planes
      b. True length of a line

D. Refinements to Shape Description using Technical Graphics practices
   1. Section Views
      a. Sectioning basics and visualization
      b. Cutting and viewing plane lines
      c. Section line practices
      d. Section View Types
      e. Special sectioning conventions
   2. Dimensioning and Tolerancing Practices
      a. Size and Location dimensions
      b. Detail dimensioning
      c. Dimensioning techniques and preferred practices
      d. Tolerancing
         1. Tolerance function and format
         2. Fit types and use of tables
   3. Geometric Dimensioning and Tolerancing Basics
      a. GDT symbols, terms, rules
      b. Datums and datum features
   4. Fastening Devices and Methods
      a. Threaded fasteners and thread terminology
      b. Thread specifications
   5. Production and Automated Manufacturing Processes
      a. Historical overview
      b. Computer-integrated manufacturing (CIM)
      c. Manufacturing Production Process
      d. Modern machining techniques
   6. Working Drawings
      a. Detail Drawings and Assembly Drawings
      b. Documentation and Reprographics

E. Technical Graphics in Industry
   1. Career opportunities in Design Technology
   2. Employment outlook and career advancement expectations
   3. Organizing professional skills for creation of a résumé

VI. METHODS OF INSTRUCTION:
- A. **Lecture** -
- B. **Demonstration** -
- C. **Field Trips** - when appropriate
- D. Integration of CAD through the use of tutorials
- E. **Guest Lecturers** - Guest presentations when available/feasible
- F. Textbook reading and reference

VII. TYPICAL ASSIGNMENTS:

A. Reading: 1. Read pages 751-767 in the Technical Graphics Communication textbook on Threads and Fasteners in preparation to complete Worksheet #16. Study Fig. 17.3 on page 754 for reference in obtaining thread form and included angle, several of the categories to be completed later on the mystery threads information worksheet. 2. Read pages 855-869 in The AutoCAD 2000 Tutor for Engineering Graphics which provides valuable background summaries of the types of sections and also techniques for using the BHATCH command for tutorial exercise #10. B. Laboratory assignments and CAD Tutorials: 1. Identify the types of surfaces (i.e., normal, inclined, oblique, and curved) on the object in the multiview.

After sketching the bounding box, sketch the normal surfaces that lie in the same planes as the bounding box sides. These surfaces, when seen in their edge views in the multiview, should form the perimeter of the views. Next, sketch the normal surfaces inside the bounding box. Since the angles of inclined and oblique surface edges cannot be calculated directly, identify the edges they share with the normal faces in the multiview and in the pictorial, then connect vertices with edges not yet completed in pictorial. 2. Follow the series of steps towards the completion of the Shifter.dwg on pages 443-464 in The AutoCAD 2000 Tutor for Engineering Graphics textbook. This tutorial is designed to allow the user to construct a three-view drawing using CAD commands OFFSET & TRIM, and using the Layer Properties Manager dialog box to set desired linetypes. Name the drawing with “your initials” 7 and save on diskette for grading. C. Problem solving projects: 1. Select a feature off the provided list and prepare a dimensioning solution, answering the questions as to size and location. Present your results in a short oral presentation to the class. 2. Select one of the stock shapes off the manufacturer’s sheet and design a complete working drawing solution to the part. Your solution should include an isometric sketch, multiview sketch, and a final working drawing on vellum or on CAD including dimensioning, tolerancing, and general notations. Both sketches should be in proportion with a stated drawing scale, showing added features such as slots, holes, keyways, etc.; your own original adaptation of the stock part into a unique product.

VIII. EVALUATION:

A. **Methods**

B. **Frequency**

1. Frequency:
   a. Weekly Laboratory assignments, CAD Tutorials and/or problem-solving projects
   b. One midterm and one final examination
   c. Weekly quizzes

IX. TYPICAL TEXTS:

1. Giesecke, Spencer, Hill, Drygdon, and Novak *Technical Drawing.* 10th ed., MacMillan Publishing Company, 1997.
2. Bertoline, Wiebe, Miller, and Mohler *Technical Graphics Communication, .* 2nd ed., McGraw-Hill, 1997.
3. Kalameja, Alan J. *The AutoCAD 2000 Tutor for Engineering Graphics.*, Thomson Learning, 2000.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. Drafting Equipment
B. Computer use certificate
C. Two diskettes