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Course Outline for DSNT 62C
THREE-DIMENSIONAL MODELING
Effective: Fall 2002

I. CATALOG DESCRIPTION:

DSNT 62C — THREE-DIMENSIONAL MODELING — 3.00 units

This course develops skills in visualizing and drawing three-dimensional shapes for modeling, testing, analysis, manufacturing, assembly, and marketing, as well as form the basis of computer animations and virtual worlds. A variety of skills and techniques for drawing, designing, editing, and display of 3-D wireframes, surfaces, and solids will be studied.

1.50 Units Lecture 1.50 Units Lab

Prerequisite

DSNT 62B - Computer Aided Design (CAD)
with a minimum grade of C

Grading Methods:

Letter Grade

Discipline:

	MIN
Lecture Hours:	27.00
Lab Hours:	81.00
Total Hours:	108.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 2

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. DSNT62B

1. manage and search for files and folders using Window Explorer;
2. apply fundamentals of mechanical design using the CAD workstation as a tool;
3. properly dimension drawings and manipulate dimension variables;
4. create and use dimension styles with appropriate overrides as required;
5. make changes to existing dimensions in accordance with drawing revisions;
6. gain additional control over creating and maintaining drawing layers;
7. add tolerancing and geometric dimensioning and tolerancing to drawings;
8. generate section views and graphic patterns;
9. construct blocks with attributes and insert them into a drawing;
10. extract attribute values to create a bill of materials;
11. use external references efficiently to create multiview layouts;
12. draw isometric drawings with dimensioning;
13. be familiar with 3-D drawing techniques and procedures;
14. utilize typical printer and plotter output devices;
15. use external commands, create scripts and slide shows;
16. demonstrate job entry level skills.

IV. MEASURABLE OBJECTIVES:

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

- A. define and maintain user-defined coordinate systems;
- B. construct a wireframe model;
- C. construct a surface model;
- D. construct a solid model;
- E. perform hidden line removal on a three dimensional model;
- F. create and use paper space layouts and model space viewports;
- G. construct two-dimensional profiles of three-dimensional solid models;
- H. render a three-dimensional model;
- I. construct solid pictorial assemblies;
- J. plot drawings containing three-dimensional models.

V. CONTENT:

- A. Introduction to three-dimensional modeling concepts
 - 1. Differences between 2-D drafting and 3-D modeling
 - 2. Differences between wireframe, surface, and solid models
 - 3. Application of grayscale and color rendering
 - 4. Practical use of and advantages of 3-D models
 - 5. Capabilities and limitations of software
- B. Software tools for working in 3-D space
 - 1. Properties of world coordinate system (WCS)
 - 2. Manage and interpret user coordinate system (UCS) icon
 - 3. Move around in 3-D space and establish variable viewports
 - 4. Construct 3-D models with 2-D drawing techniques
 - 5. Set-up and manipulate multiple viewports
- C. Drawing and modifying wireframe models
 - 1. How 2-D objects can be used in 3-D space to make wireframe models
 - 2. Develop familiarity with 3-D wireframe modification commands
 - 3. Draw complex curves that undulate through 3-D space
- D. Defining surfaces between edges of a 3-D object (Surface Models)
 - 1. Properties and characteristics of surface objects
 - 2. Judge appropriateness of where and when to use extruded surfaces
 - 3. Selecting the best command for surfacing a particular planar area
 - 4. Create nonplanar surfaces with almost any shape
 - 5. Improve surface shapes through the use of editing commands
 - 6. Use clipping planes to eliminate obstructions from surface models and create realistic perspective views
- E. Introduction to Solid Modeling features
 - 1. Develop familiarity with properties of 3-D solid objects
 - 2. Create 3-D solids having basic or primitive geometric shapes
 - 3. Create 3-D solids by extruding and revolving profile objects
 - 4. Build complex solid models by using Boolean operations to combine and modify basic 3-D solid geometric forms
 - 5. Use tools for modifying one solid object at a time
 - a. Fillet and chamfer sharp corners on 3-D solids
 - b. Slice 3-D solids into two pieces
 - c. Edit faces and edges of 3-D solids
 - d. Hollow out 3-D solids
 - 6. Control the appearance of 3-D solids
 - 7. Calculate geometric and mass properties of 3-D solids
 - 8. Check for interference between mating 3-D solids
- F. Techniques for making 2-D drawings of 3-D models
 - 1. Purpose and properties of paper space
 - 2. Differences between tiled viewports and floating viewports
 - 3. Create and manage paper space layouts and floating viewports
 - 4. Set up multiview drawings of wireframe and surface models in paper space
 - 5. Control display of objects and layers within floating viewports
 - 6. Add annotation and dimensions to drawings of 3-D models
 - 7. Create 2-D and 3-D wireframes from 3-D solids
 - 8. Create 2-D drawings of a 3-D model as seen from any viewpoint
 - 9. Use specialized commands to create 2-D drawings from 3-D solid models
- G. Using rendering to impart realism on a 3-D model
 - 1. Set up various parameters to efficiently make renderings, control output, and create special backgrounds
 - 2. Properties and installation of the different types of lights for renderings
 - 3. Control shadows in renderings
 - 4. Create materials that have color, transparency, and reflectivity
 - 5. Attach bitmap images to objects in creating realistic renderings
 - 6. Enhance realism by installing images of objects, particularly landscape objects, into renderings
 - 7. Emphasize distance by fading or shading objects

VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. **Demonstration** -
- C. **Written exercises and case studies** - Written exercises in conjunction with computer analysis
- D. **Classroom Activity** - Hands-on activities and computer laboratory time
- E. Textbook referrals and readings from periodicals
- F. individual consultation

VII. TYPICAL ASSIGNMENTS:

A. Complete a wireframe model of the object shown below. The viewpoint for the plot of the wireframe model should be 325° with the X axis, and 20° with the XY plane. The model should be plotted at a scale of 2=1 on 8.5"x11" paper with .50 borders on all sides. The plot should contain your name, class, and assignment number. The text must be justified as shown on the attached sample. B. Retrieve the 3-D surface model house drawing, set up as a perspective view. Initiate the RMAT command, making certain that the material type is Standard, and click the New button. In the New Standard Material dialog box, name the new material SIDING, and the value of the Color/Pattern, Ambient, and Reflection attributes to 1.00. Activate the Color/Pattern attribute, click the BY ACI checkbox off, set the Red and Green color values to 0.80, and the Blue color value to 0.50. Click on the OK button, then in the Materials dialog box, click the By Layer button to bring up the Attach by Layer dialog box. Highlight SIDING and layer Wall_sf. Click the Attach button, then OK button. Finish this exercise by rendering the scene.

VIII. EVALUATION:

- A. **Methods**
- B. **Frequency**
 - 1. Frequency:
 - a. Weekly assignments, quizzes, participation
 - b. One Midterm test and/or Final examination/project

IX. TYPICAL TEXTS:

- 1. Shumaker/Madsen *AutoCAD and its Applications (Advanced)*., Goodheart-Willcox Company, Inc, 2001.
- 2. Wilson, John *AutoCAD 2000:3D Modeling, A Visual Approach*., Thomson Learning, 2000.
- 3. Ethier, Stephen J. and Christine A *AutoCAD in 3 Dimensions*. 2nd ed., Prentice Hall, 1997.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Two 3 ½", high density floppy diskette
- B. Computer use certificate
- C. 3-ring notebook