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**CUYAHOGA COMMUNITY COLLEGE
OFFICIAL COURSE OUTLINE
Mapped**

SUBJECT AREA TITLE

Mechanical Engineering Technology/Manufacturing Industrial Engineering Technology

COURSE TITLE

3D Solid Modeling

SUBJECT AREA CODE-COURSE NUMBER

MET - 2601

COURSE CREDIT HOURS

3.00

I. DESCRIPTION OF COURSE:

A. CATALOG DESCRIPTION: Introduction to computer-aided engineering, design of mechanical component and system using computer-aided design technique, AutoCAD solid and surface model for product development, optimization of design and design documentation. Complete set of production drawings created using 3D drawing environments. Principles of parametric design, and functional assemblies directly applied. Emphasis tailored to 3D modeling for enhanced part description. Students work on individual design projects to stimulate spatial abilities and problem-solving techniques.

B. LECTURE HOURS: 2.0

C. LAB HOURS: 3.00

D. OTHER REQUIRED HOURS: 00

E. PREREQUISITE(S):

MET-1200 Engineering Drawing, and , MET-1220 AutoCAD 2D

II. GENERAL EDUCATION OUTCOMES:

Upon satisfactory completion of MET 2601 - 3D Solid Modeling, the student should be able to perform the following outcomes and supporting objectives:

A. Outcome: Critical Thinking: Analyze and synthesize ideas to make evidence-based decisions and find rational solutions to problems.

Supporting Outcomes:

1. Use AutoCAD solid and surface modeling tools to create computer model of designed object.
2. Create a complete set of production drawings with specified geometric and feature changes for a specified class assignment.
3. Re-design a product and follow it through the design process

B. Outcome: Information Literacy: Determine where and how to acquire, evaluate, and ethically use information from multiple sources for academic success and lifelong learning.

Supporting Outcomes:

1. Re-design a product and follow it through the design process

C. Outcome: Oral Communication: Produce verbal and non-verbal communication for an intended audience that is clear and concise, uses standard rules for spoken language, and effectively organizes language, images and other symbols.

Supporting Outcomes:

1. Re-design a product and follow it through the design process
2. Re-design a product and follow it through the design process

D. Outcome: Written Communication: Produce writing for an intended audience that is clear and concise, uses standard rules for written language, and effectively organizes language, images and other symbols.

Supporting Outcomes:

1. Re-design a product and follow it through the design process

III. OUTCOMES/OBJECTIVES:

Upon satisfactory completion of MET 2601 - 3D Solid Modeling, the student should be able to perform the following outcomes and supporting objectives:

A. Outcome: Use AutoCAD solid and surface modeling tools to create computer model of designed object.

Supporting Objectives:

1. Demonstrate an understanding of the different phases of mechanical design.
2. Demonstrate an understanding of the computer in all phases of design process.
3. Create orthographic and section view of object from solid model.
4. Analyze mass and geometric properties of model created.
5. Create solid model part drawings with CAD software capabilities.
6. Use constraints effectively in part modeling
7. Create orthographic drawings from 3d models
8. Modify 3D models with software rendering techniques.
9. Apply materials to part for display and printing
10. Demonstrate an understanding of the manufacturing processes of rapid prototyping that utilize 3D CAD drawings.
11. Recognize the relationship between 3D models and rapid prototyping
12. Understand the process of rapid prototyping

B. Outcome: Create a complete set of production drawings with specified geometric and feature changes for a specified class assignment.

Supporting Objectives:

1. Create solid model part drawings with CAD software capabilities.
2. Create a complete 3D assembly drawing
3. Extract orthographic views of each part
4. Apply the proper tolerance specifications to part dimensions

C. Outcome: Re-design a product and follow it through the design process

Supporting Objectives:

1. Create orthographic and section view of object from solid model.
2. Use constraints effectively in part modeling
3. Create orthographic drawings from 3d models

4. Modify 3D models with software rendering techniques.
5. Apply materials to part for display and printing
6. Create 3D presentation assemblies from 3d parts
7. Utilize interference and clearance assembly analysis

IV. COURSE CONTENT:

A. Concepts

1. Production drawings
2. Parametric design changes
3. Feature-based design
4. Geometric parameters
5. Assembly drawings
6. General assembly
7. Exploded assembly
8. Sectioned assembly
9. View/model rendering
10. Rendering
11. Solid modeling
12. Individual class project
13. Project requirements
14. Tolerances
15. Design process
16. AutoCAD surface modeling
17. Assembly modeling
18. Design analysis
19. Computer aided engineering
20. Engineering design process
21. Concurrent Engineering

B. Skills

1. Computer efficiency
2. Software application and customization
3. Integrating programming for individualized software application
4. Debugging program code
5. Design and modify parts and systems using a design process
6. Applying and identifying the proper tolerances for a drawing
7. Creating 2 D detail and assembly drawings
8. Utilizing threads on drawings with the proper standards.
9. Team work and oral communication

C. Issues

1. Working with diverse individuals and teams
2. Developing a level of comfort with the computer and software
3. Developing a positive attitude about using tools of the Engineering field.
4. Presenting solutions using a problem solving process.

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V. METHODS OF STUDENT EVALUATION MAY INCLUDE ANY OF THE FOLLOWING:

- A. Assignments
- B. Tests
- C. Final examination

VI. RESOURCES MAY INCLUDE ANY OF THE FOLLOWING:

- A. Banach, Daniel T., Jones, Travis, Kalameja, Alan J. . *Autodesk Inventor 2012 Essentials Plus*. Cengage Learning, 2011.
- B. Bethune, James. *Engineering Design Graphics with Autodesk Inventor2011*. 1st ED Pren Hall, Saddle Creek, NJ., 2012.
- C. Shih, Randy H.. *An Introduction to Autodesk Inventor 2013 and AutoCAD 2013*. SDC Publications, Inc., 2012.

VII. ADDITIONAL RESOURCES:

AutoCAD and Inventor software.
Laboratory exercise handout.
USB Drive