

**OAN Number:**

**OAN Date:**

**Board of Trustees Date: 06/19/14**

**Effective Date: 08/25/14**

**CUYAHOGA COMMUNITY COLLEGE  
OFFICIAL COURSE OUTLINE  
Mapped**

**SUBJECT AREA TITLE**

Mechanical Engineering Technology/Manufacturing Industrial Engineering Technology

**COURSE TITLE**

Drawing & AutoCAD

**SUBJECT AREA CODE-COURSE NUMBER**

MET - 1230

**COURSE CREDIT HOURS**

3.00

**I. DESCRIPTION OF COURSE:**

A. CATALOG DESCRIPTION: Apply visualization skills in the interpretation of orthographic projections and pictorial drawings. Applied geometry, use of scales, sections, and auxiliary views are studied. Dimensioning standards and conventions as applied to detail and assembly drawings in manual drafting as well as use of CAD system to accomplish drafting tasks are emphasized. Includes overviews of computer terms and functions of the Windows Operating System. Covers special terms and definitions used in computer-assisted drafting, the roles technical drawings play in production, manufacturing and products design process.

B. LECTURE HOURS: 2.00

C. LAB HOURS: 3.00

D. OTHER REQUIRED HOURS: 00

E. PREREQUISITE(S):

Eligibility for MATH-0950 Beginning Algebra I.

**II. GENERAL EDUCATION OUTCOMES:**

Upon satisfactory completion of MET 1230 - Drawing & AutoCAD , the student should be able to perform the following outcomes and supporting objectives:

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

Supporting Outcomes:

1. Draw and interpret various types of Engineering drawings in accordance with standard dimensioning practices and conventions.
2. Relate engineering drawings to manufacturing practices and processes and communicate in an appropriate manner with various audiences.
3. Use CAD software as a tool to draft and edit engineering drawings.
4. Communicate with other CAD operators, using the terms and definitions applicable to CAD.

**B. 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. Draw and interpret various types of Engineering drawings in accordance with standard dimensioning practices and conventions.

**C. 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. Relate engineering drawings to manufacturing practices and processes and communicate in an appropriate manner with various audiences.
2. Use CAD software as a tool to draft and edit engineering drawings.
3. Communicate with other CAD operators, using the terms and definitions applicable to CAD.

### **III. OUTCOMES/OBJECTIVES:**

Upon satisfactory completion of MET 1230 - Drawing & AutoCAD , the student should be able to perform the following outcomes and supporting objectives:

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**A. Outcome: Draw and interpret various types of Engineering drawings in accordance with standard dimensioning practices and conventions.**

Supporting Objectives:

1. Demonstrate the use of engineering drawing instruments, including sketching, scales, and basic tools such as compass, straight edges, and triangles.
2. Demonstrate the proper use of points, lines and planes in technical drawings.
3. Interpret geometrical figures, symbols, and construction as used in technical drawings.
4. Draw and interpret multi-view orthographic sketches and drawings.
5. Draw and interpret axonometric sketches and drawings.
6. Draw and interpret section views on a drawing.
7. Draw and interpret auxiliary views on drawings.
8. Draw and interpret oblique sketches and drawings.
9. Utilize standard dimensioning practices and conventions.
10. Discuss the use and importance of notes on a drawing.

**B. Outcome: Relate engineering drawings to manufacturing practices and processes and communicate in an appropriate manner with various audiences.**

Supporting Objectives:

1. Discuss production and manufacturing processes and their relationship to technical graphics.
2. Describe the engineering design process.
3. Explain the language of the engineering field
4. Relate the proper communication method to the proper audience.
5. Demonstrate improved mental visualization skills.
6. Work with others in class to foster interpersonal skills.
7. Draw and interpret detail and assembly drawings.

**C. Outcome: Use CAD software as a tool to draft and edit engineering drawings.**

Supporting Objectives:

1. Discuss the applications of AutoCAD as related to technical drawing.
2. Apply the concepts of this drafting tool to a variety of technical drawing.
3. Identify the major components of the CAD workstation.
4. Identify the various operating systems needed to power up the computer, handle files, and implement the CAD programs.
5. Enter the necessary commands to implement instructions using a variety of input

devices.

6. Have the ability to save, open, plot, and begin a new drawing file.
7. Implement edit commands to properly modify existing objects.
8. Select and utilize the proper formatting for a drawing.
9. Demonstrate an understanding of the use of layers and judiciously implement them in a drawing.
10. Use the hatch command and edit features.
11. Demonstrate the ability to develop, store and use a block.
12. Dimension a drawing following proper standards and practices with the application of dimensioning variables and various dimensioning options and edits.
13. Discuss the flexibility of utilizing various commands.

**D. Outcome: Communicate with other CAD operators, using the terms and definitions applicable to CAD.**

Supporting Objectives:

1. Define CAD-specific terminology.
2. Use appropriate CAD-based vocabulary when discussing drawing projects.
3. Discuss the advantages and disadvantages of the CAD software.

#### **IV. COURSE CONTENT:**

##### **A. Introduction**

1. Objectives, content and organization of the course
2. Identification of equipment required of students
3. Selection criteria to aid in the selection of equipment

##### **B. Lettering**

1. Techniques
2. Types

##### **C. Use and application of instruments and scales:**

1. Architect's and civil engineer's
2. Mechanical engineer's
3. Metric

##### **D. Characteristics and uses of lines in a drawing**

1. ABC's of lines
2. Line weights
3. Precedence of lines
4. Sketching techniques

##### **E. Applied geometry**

1. Parallel and perpendicular lines
2. Regular polygons

3. Dividing into equal parts
4. Tangents, locating centers
5. Bisecting lines and angles
- F. Multi-view orthographic drawing and sketching
  1. Definition of orthographic projection
  2. Standard views and their interpretation
  3. Points, lines, surfaces
  4. Fillets and rounds, run outs
- G. Pictorial drawing and sketching
  1. Principles and applications of axonometric and oblique drawings
  2. Practice in isometric and oblique drawing with sketching
- H. Sectional views
  1. Full
  2. Half
  3. Revolved
  4. Removed
  5. Offset
  6. Aligned sections
  7. Exceptions to section rules
  8. Conventional breaks
- I. Auxiliary views
  1. Normal views of inclined and oblique surfaces
  2. Projection methods
- J. Dimensioning
  1. Drawing to scale
  2. Selection and placement of dimensions
  3. Dimensioning standard features
  4. Aligned and unidirectional dimensioning
  5. Baseline and chain dimensioning
  6. Drawing symbols
- K. Design process
  1. General
  2. Local
  3. Leaders
  4. Symbols
- L. Types and sets of drawings and their purposes
  1. Detail and assembly drawings
  2. Normal inclusions and omissions
- M. Introduction to the computer and AutoCAD system
  1. Operations systems and platforms
  2. Hardware; loading the AutoCAD program
  3. Screen display arrangement
  4. Menu breakdown and selections
  5. Dialog boxes and tool bars
  1. Input device commands
    - a. Mouse
    - b. Keyboard
    - c. Menus

d. Icons

N. Introduction to Drawing files

1. Beginning and naming new files
2. Saving files
3. Printing and plotting files
4. Opening existing files
5. Drawing setup for units and limits.

O. Introductory Draw commands

1. Line and point entry
2. Coordinate systems
3. Circles and arcs
4. D text/Text commands and their justification

P. Drawing aids and display features

1. Grid, snap and ORTHO command
2. Object snaps
3. Help
4. Zoom, pan and view commands

Q. Basic editing

1. Erase command and selection options
2. Fillets and chamfers
3. Breaks, trims and extends
4. Undo, u and redo
5. Move and copy
6. Mirror; offset

R. Intermediate Draw and Editing

1. Polygons
2. Polylines
3. Solid
4. Donut
5. Hatching
6. Multi lines
7. Scale and rotate
8. Divide and measure
9. Change, DDEDIT, CHPROP, and DDMODIFY
10. Lt scale

S. Special features

1. Grips
2. Layers
3. P line and M line
4. Blocks, attributes

T. Inquiry

1. Distance
2. List
3. Id
4. Area

U. Dimensioning

1. Types of dimensions
2. Special options

3. Special editing
4. Dimensioning variables
- V. Proper format for a drawing
  1. Units
  2. Paper size
  3. Display
  4. Border
  5. Layers
  6. Template files

W. Communication

1. Using proper terminology
2. Working in a diverse environment
3. Effective verbal communication techniques

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

- A. Quizzes and/or midterm examination
- B. Final examination
- C. Drawing assignments, Worksheets
- D. Written Assignment
- E. Oral Presentation

**VI. RESOURCES MAY INCLUDE ANY OF THE FOLLOWING:**

- A. Bethune, James. *Engineering Graphics with AutoCAD 2008*. Upper Saddle River, NJ, 2008.
- B. Dix, Mark and Paul Riley. *Discovering AutoCAD 2008*. Upper Saddle River, NJ, 2008.
- C. Giesecke, Frederick E. et al. *Technical Drawing*. 14th Ed Upper Saddle River, NJ. Prentice Hall, 2013.
- D. Hart, Hillary. *Introduction to Engineering Communication*. 2nd ED Upper Saddle River, NJ. Prentice Hall, 2009.
- E. Koser, Gary and Dean Zirwas. *Workplace skills for success with AutoCAD 2008 basics: a layered learning approach..* Upper Saddle River, NJ, 2008.
- F. Lehmann, K. F. *Journal of Mechanical Design* . 10-01-2007 American Society of Mechanical EngineersNew York , 2007.
- G. Paul, Frank Puerta and Jim Fitzgerald. *Autocad 2008 in 2D and 3D: A Modern Approach*. Upper Saddle River, NJ, 2008.
- H. Prentice Hall. *Technical Drawing 101 with AutoCAD*. 2nd ED Upper Saddle River, NJ, 2011.
- I. . "Monthly Newton Massachusetts:Questex Media Group, Inc.,." *Questex* 10-01-2007. "www.Cadalyst.com." Massachusetts:Questex Media Group, Inc.,

**VII. ADDITIONAL RESOURCES:**

- Assignment and Project handouts
- AutoCad software