

# MET-1230: DRAWING & AUTOCAD

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## Cuyahoga Community College

**Viewing: MET-1230 : Drawing & AutoCAD**

**Board of Trustees:**

June 2023

**Academic Term:**

Fall 2023

**Subject Code**

MET - Mech Eng/Manuf Ind Eng Tech

**Course Number:**

1230

**Title:**

Drawing & AutoCAD

**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.

**Credit Hour(s):**

3

**Lecture Hour(s):**

2

**Lab Hour(s):**

3

## Requisites

**Prerequisite and Corequisite**

MATH-0955 Beginning Algebra or qualified Math placement to place into MATH-0965 Intermediate Algebra.

## Outcomes

**Course Outcome(s):**

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

**Objective(s):**

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

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**Course Outcome(s):**

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

**Objective(s):**

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.

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**Course Outcome(s):**

Use CAD software as a tool to draft and edit engineering drawings.

**Objective(s):**

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.

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**Course Outcome(s):**

Communicate with other CAD operators, using the terms and definitions applicable to CAD.

**Objective(s):**

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.

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**Methods of Evaluation:**

- a. Quizzes and/or midterm examination
- b. Final examination
- c. Drawing assignments, Worksheets
- d. Written Assignment
- e. Oral Presentation

**Course Content Outline:**

- a. Introduction
  - i. Objectives, content and organization of the course
  - ii. Identification of equipment required of students
  - iii. Selection criteria to aid in the selection of equipment
- b. Lettering
  - i. Techniques
  - ii. Types
- c. Use and application of instruments and scales:
  - i. Architect's and civil engineer's
  - ii. Mechanical engineer's
  - iii. Metric
- d. Characteristics and uses of lines in a drawing

- i. ABC's of lines
  - ii. Line weights
  - iii. Precedence of lines
  - iv. Sketching techniques
- e. Applied geometry
  - i. Parallel and perpendicular lines
  - ii. Regular polygons
  - iii. Dividing into equal parts
  - iv. Tangents, locating centers
  - v. Bisecting lines and angles
- f. Multi-view orthographic drawing and sketching
  - i. Definition of orthographic projection
  - ii. Standard views and their interpretation
  - iii. Points, lines, surfaces
  - iv. Fillets and rounds, runouts
- g. Pictorial drawing and sketching
  - i. Principles and applications of axonometric and oblique drawings
  - ii. Practice in isometric and oblique drawing with sketching
- h. Sectional views
  - i. Full
  - ii. Half
  - iii. Revolved
  - iv. Removed
  - v. Offset
  - vi. Aligned sections
  - vii. Exceptions to section rules
  - viii. Conventional breaks
- i. Auxiliary views
  - i. Normal views of inclined and oblique surfaces
  - ii. Projection methods
- j. Dimensioning
  - i. Drawing to scale
  - ii. Selection and placement of dimensions
  - iii. Dimensioning standard features
  - iv. Aligned and unidirectional dimensioning
  - v. Baseline and chain dimensioning
  - vi. Drawing symbols
- k. Design process
  - i. General
  - ii. Local
  - iii. Leaders
  - iv. Symbols
- l. Types and sets of drawings and their purposes
  - i. Detail and assembly drawings
  - ii. Normal inclusions and omissions
- m. Introduction to the computer and AutoCAD system
  - i. Operations systems and platforms
  - ii. Hardware; loading the AutoCAD program
  - iii. Screen display arrangement
  - iv. Menu breakdown and selections
  - v. Dialog boxes and toolbars
  - i. Input device commands
    - 1. Mouse
    - 2. Keyboard
    - 3. Menus
    - 4. Icons
- n. Introduction to Drawing files
  - i. Beginning and naming new files
  - ii. Saving files

- iii. Printing and plotting files
- iv. Opening existing files
- v. Drawing setup for units and limits.
- o. Introductory Draw commands
  - i. Line and point entry
  - ii. Coordinate systems
  - iii. Circles and arcs
  - iv. D text/Text commands and their justification
- p. Drawing aids and display features
  - i. Grid, snap, and ORTHO command
  - ii. Object snaps
  - iii. Help
  - iv. Zoom, pan, and view commands
- q. Basic editing
  - i. Erase command and selection options
  - ii. Fillets and chamfers
  - iii. Breaks, trims, and extends
  - iv. Undo, u and redo
  - v. Move and copy
  - vi. Mirror; offset
- r. Intermediate Draw and Editing
  - i. Polygons
  - ii. Polylines
  - iii. Solid
  - iv. Donut
  - v. Hatching
  - vi. Multi lines
  - vii. Scale and rotate
  - viii. Divide and measure
  - ix. Change, DDEDIT, CHPROP, and DDMODIFY
  - x. Lt scale
- s. Special features
  - i. Grips
  - ii. Layers
  - iii. P line and M line
  - iv. Blocks, attributes
- t. Inquiry
  - i. Distance
  - ii. List
  - iii. Id
  - iv. Area
- u. Dimensioning
  - i. Types of dimensions
  - ii. Special options
  - iii. Special editing
  - iv. Dimensioning variables
- v. Proper format for a drawing
  - i. Units
  - ii. Paper size
  - iii. Display
  - iv. Border
  - v. Layers
  - vi. Template files
- w. Communication
  - i. Using proper terminology
  - ii. Working in a diverse environment
  - iii. Effective verbal communication techniques

## Resources

Kirstie Plantenberg. *Engineering Graphics Essentials With AutoCAD 2023 Instructions*. SDC publications, 2022.

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Smith, Douglas, Antonio Ramirez, Ashleigh Congdon-Fuller. *Technical Drawing 101 With AutoCAD 2022: A Multidisciplinary Guide to Drafting Theory and Practice*. SDC Publications, 2021.

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*Journal of Mechanical Design*. ASME, 2021. <https://asmejmd.org/>

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Bethune, Jim and David Byrnes. *Engineering Graphics with AutoCAD 2023*. Pearson, 2023.

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Dix, Mark and Paul Riley. *Discovering AutoCAD 2020*. Pearson Education, Inc., 2020.

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### Resources Other

- Assignment and Project handouts
- AutoCad software

Top of page

Key: 2884