Lakeshore Technical College

10-606-101 Basic Mechanical Drafting (AutoCAD)

Course Outcome Summary

Course Information

Alternate Title Drafting I, Mechanical Drafting I

Description Provides the learner with the skills to utilize AutoCAD drawing editor, view commands; apply coordinate entry methods, AutoCAD file commands; utilize draw commands, modify commands; create and edit text, create print and plot; apply geometric construction techniques to solve a drawing problem; utilize selection sets, duplicating modify commands, layer and object properties, blocks; apply principles of orthographic and multi-view projection.

Total Credits 2

Total Hours 72

Types of Instruction

Instruction Type	Credits/Hours
In Person	72

Pre/Corequisites

Prerequisite None

Textbooks

Giesecke, Mitchell, Spencer, Hill, Dygdon, Novak and Lockhart. *Modern Graphics Communication 5th Edition*. Prentince Hall. 2018.**Edition:** 5th. ISBN: 978-0-13-484871-6 Required.

James A Leach, Shawna Lockhart, Eric Tilleson. *AutoCAD 2020Instructor*. SDC Publications. 2019 **ISBN:** 978-1-63057-257-0. Required.

Learner Supplies

USB Drive Required.

Core Abilities

1. Apply sustainable practices

Criteria

1.1. Learner demonstrates awareness of the ecological impact related to his/her chosen area of study
1.2. Learner identifies environmental conservation strategies
1.3. Learner can identify how sustainable practices produce a lean work environment
1.4. Learner incorporates sustainable practices (environmental, economic, social, and cultural) during the decision making process

2. Demonstrate responsible and professional workplace behaviors

Criteria

2.1. Learner displays behavior consistent with the ethical standards within a discipline or profession
2.2. Learner follows policies and procedures
2.3. Learner attends class as mandated by the instructor
2.4. Learner completes assignments on time
2.5. Learner exhibits academic honesty
2.6. Learner accepts responsibility and accountability for his/her actions
2.7. Learner demonstrates time management and task prioritization
2.8. Learner demonstrates ability to handle ambiguity and unfamiliar situations

3. Integrate technology

Criteria

3.1. Learner determines which tasks can be performed more efficiently by using technology
3.2. Learner uses technology to perform tasks more efficiently
3.3. Learner adapts to changing/emerging technology
3.4. Learner selects culturally appropriate technology/tools to communicate with diverse groups

4. Respect and appreciate diversity

Criteria

4.1. Learner demonstrates respectful workplace actions for successfully working with a diverse workforce (race, color, creed, national origin, religion, age, sex, sexual orientation, disability, and other differences).
4.2. Learner observes business customs/etiquette, time zone differences, and holidays
4.3. Learner identifies own bias and can adapt to the customs and practices of others
4.4. Learner demonstrates respectful behavior for living/working in a diverse society

5. Use mathematics effectively

Criteria

5.1. Learner solves real world problems using mathematics
5.2. Learner measures accurately
5.3. Learner analyzes graphical information
5.4. Learner demonstrates an understanding of world measurements and foreign currency exchange

6. Work cooperatively

Criteria

6.1. Learner contributes to a group with ideas, suggestions, and effort
6.2. Learner completes his/her share of tasks necessary to complete a project
6.3. Learner encourages team members by listening and responding appropriately to their contributions
6.4. Learner maintains self control
6.5. Learner resolves differences for the benefit of the team
6.6. Learner accepts constructive feedback
6.7. Learner effectively establishes rapport and builds situationally appropriate relationships

Program Outcomes

1. Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.

2. Function effectively on both self-directed and team-oriented projects.

Course Competencies

1. Utilize AutoCAD Drawing Editor

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
1.1. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

1.1. you average 85% on all written assignments
1.2. learner uses different methods for entering commands
1.3. you complete assignment in a lab setting

Learning Objectives
1.a. Explain why drawing should be created full size in actual units.
1.b. Start and exit AutoCAD.
1.c. Identify the areas of the AutoCAD Drawing Editor and know the function of each.
1.d. Explain how the Cartesian Coordinate (X,Y,Z) System is used to define the location of drawing elements.
1.e. Identify the different methods of entering commands.

2. Utilize Viewing Commands

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
2.1. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

2.1. you average 85% on all written assignments
2.2. you complete assignment in a lab setting
2.3. learner uses Zoom options to manipulate screen display according, to text and lecture/demonstration

Learning Objectives
2.a. Explain the relationship between the drawings objects and the display of those objects.
2.b. Use Zoom options (Window, Extents, Scale etc...) to modify viewing area of a drawing.
2.c. Use Realtime Zoom option.
2.d. Use Realtime Pan option.

3. Apply Coordinate Entry Methods

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors
Integrate technology
Use mathematics effectively

Linked Program Outcomes

Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies

3.1. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

3.1. you complete assignment in a lab setting
3.2. you average 85% on all written assignments
3.3. learner uses Object Snap modes to complete drawing assignments, according to text and lecture/demonstration
3.4. learner completes drawing assignments utilizing Absolute Cartesian, Relative Cartesian, Relative Polar, and Direct Distance Entry coordinate methods for creating objects

Learning Objectives

3.a. Explain what a drawing object is.
3.b. Create objects by specifying "Absolute Cartesian" coordinates.
3.c. Create objects by specifying "Relative Cartesian" coordinates.
3.d. Create objects by specifying "Relative Polar" coordinates.
3.e. Create objects by specifying "Direct Distance Entry".
3.f. Explain the difference between Single and Running Object Snap modes.
3.g. Utilize Running Object Snap modes to position objects.
3.h. Use Polar Tracking and Polar Snap to draw lines interactively.

4. Apply AutoCAD File Commands

Linked Core Abilities

Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes

Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies

4.1. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

4.1. you complete assignment in a lab setting
4.2. you average 85% on all written assignments
4.3. learner has adapted good file management techniques

Learning Objectives

4.a. Assign a name to a drawing file.
4.b. Use file-related dialog boxes.
4.c. Start a new drawing from scratch.
4.d. Open and close existing drawings.
4.e. Use "Save As" to save a drawing under a different name, path, and/or format.
4.f. Create new folders.

5. Utilize Draw Commands

Linked Core Abilities

Demonstrate responsible and professional workplace behaviors
Integrate technology
Use mathematics effectively

Linked Program Outcomes

Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD

(Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies

5.1. Drawing assignments
5.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

5.1. you complete assignment in a lab setting
5.2. you average 85% on all written assignments
5.3. learner uses various methods for creating lines, arcs, circles, points, ellipses, polygons, and polylines according to text and lecture/demonstration.

Learning Objectives

5.a. Draw lines.
5.b. Draw circles using different circle options.
5.c. Draw arcs using different options.
5.d. Create points and specify point style.
5.e. Create polylines with width and combine of lines and arc segments.
5.f. Create polygons by using circumscribe and inscribe.
5.g. Create ellipse using the axis end method and the center method.

6. Utilize Modify Commands

Linked Core Abilities

Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes

Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies

6.1. Drawing assignments
6.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

6.1. you complete assignment in a lab setting
6.2. you average 85% on all written assignments
6.3. learner shortens and lengthens existing lines, arcs, and circles according to text and lecture/demonstration.
6.4. learner creates fillets and chamfers, according to text and lecture/demonstration.
6.5. learner moves and rotates objects, according to text and lecture/demonstration.

Learning Objectives

6.a. Explain two ways to invoke Modify commands.
6.b. Use the Erase command to remove objects.
6.c. Use the Move command to relocate objects.
6.d. Use the Rotate command to change the orientation of an object or objects.
6.e. Use the lengthen command to shorten or extend lines and arcs.
6.f. Use the Trim command to trim away parts of objects at cutting edges.
6.g. Use the Extend command to extend objects to selected boundary edges.
6.h. Utilize the Break command.
6.i. Create a Fillet between two objects.
6.j. Create a Chamfer between two objects.
6.k. Use the Fillet command to create sharp corners.

7. Create and Edit Text

Linked Core Abilities

Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
7.1. Drawing assignments
7.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

7.1. you complete assignment in a lab setting
7.2. learner adds text to a drawing, according to text and lecture/demonstration.
7.3. learner establishes new text parameter: Font Style, Size, Angle, etc..., according text, lecture/demonstration.
7.4. learner edits existing text on a drawing, according to text and lecture/demonstration.
7.5. you average 85% on all written assignments

Learning Objectives
7.a. Create lines of text in a drawing using Dtext.
7.b. Create text styles with the text style command.
7.c. Create and format paragraph text using the Mtext command.
7.d. Identify the different justify text methods.
7.e. Explain the difference between Ddedit and Properties commands.
7.f. Use the Spell command to check spelling, find and replace text in a drawing.
7.g. Explain how Qtext (QuickText) and Textfill can be used to control the appearance of text in a drawing or print/plot.

8. Create Prints and Plots

Linked Core Abilities
Apply sustainable practices
Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
8.1. Use drawing assignments
8.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

8.1. learner completes assignment in a lab setting
8.2. learner averages 85% on all written assignments
8.3. learner sets up the Plot and Page Setup dialog boxes, according to text lecture/demonstration.
8.4. learner creates a printed or a plotted copy of a drawing file, according to text and lecture/demonstration.
8.5. learner saves a drawing as a PDF and e-mails to instructor.

Learning Objectives
8.a. Explain basic steps for plotting.
8.b. Use the Plot and page Setup dialog boxes.
8.c. Select from available plotting devices and set paper size orientation.
8.d. Specify what area of the drawing you want to plot.
8.e. Preview the plot before creating a plotted drawing.
8.f. Specify a scale for plotting a drawing.
8.g. Use the Plot and Page Setup dialog box to save a PDF file.

9. Apply Geometric Construction Techniques to Solve a Drawing Problem

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
9.1. Drawing assignments
9.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

9.1. learner completes assignment in a lab setting
9.2. learner averages 85% on all written assignments
9.3. learner uses geometric construction techniques to solve drafting problems, according to text and lecture/demonstration.

Learning Objectives
9.a. Draw an arc tangent to a line and through a point.
9.b. Draw an arc tangent to an arc and through a point.
9.c. Draw an arc through two points at a specified radius.
9.d. Draw a line tangent to an arc.

10. Utilize Selection Sets

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
10.1. Drawing assignments
10.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

10.1. learner completes assignment in a lab setting
10.2. learner averages 85% on all written assignments
10.3. learner uses various selection set options for selecting objects, according to text and lecture/demonstration

Learning Objectives
10.a. Explain how to access Selection Set options.
10.b. Explain the difference between a window and a window crossing.
10.c. Use different selection set options.
10.d. Add and remove objects from selection sets.
10.e. Use Object Selection Filters commands (Dselect and Filter) to select specific properties (color, layer, linetype etc...) of objects.
10.f. Explain Noun/Verb and Verb/Noun order of commands syntax.

11. Utilize Duplicating Modify Commands

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors

Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
11.1. Drawing assignments
11.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

11.1. learner completes assignment in a lab setting
11.2. learner averages 85% on all written assignments
11.3. learner creates copies of objects, according to text and lecture/demonstration.
11.4. learner creates mirror images of existing objects, according to text and lecture/demonstration.
11.5. learner creates multiple copies of existing objects using the Array options Rectangular and Polar, according to text and lecture/demonstration.
11.6. learner parallel objects using Offset, according to text and lecture/demonstration.

Learning Objectives
11.a. Use the Copy command to copy objects.
11.b. Use the Mirror command to copy a mirrored image of selected objects.
11.c. Create parallel copies of objects using the Offset command.
11.d. Create Rectangular and Polar arrays of existing objects.

12. Utilize Layers and Objects Properties

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
12.1. Drawing assignment
12.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:

12.1. learner creates new layers and assign color, linetype, and lineweight; according to text and lecture/demonstration.
12.2. learner changes visibility of layers using On, Off, Freeze, Thaw, Lock, Unlock; according to text and lecture/demonstration.
12.3. learner changes objects properties, according to text and lecture/demonstration.
12.4. learner creates an english and a metric template files with assigned layers.
12.5. learner completes assignment in a lab setting
12.6. learner averages 85% on all written assignments

Learning Objectives
12.a. Explain the strategy of grouping related geometry with layers.
12.b. Create new layers.
12.c. Assign color, linetype, and lineweight to layers.
12.d. Change layer properties and visibility settings (On, Off, Freeze, Thaw, Lock, and Unlock).
12.e. Change object properties (layer, color, linetype, and lineweight) using the Properties command.
12.f. Change objects using the Match Properties command.
12.g. Create template files.

13. Utilize Blocks

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors
Integrate technology

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
13.1. Drawing assignments
13.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:
13.1. learner completes assignment in a lab setting
13.2. learner averages 85% on all written assignments
13.3. learner inserts block borders, according to text and lecture/demonstration

Learning Objectives
13.a. Explain what a block is.
13.b. Use the Block Insert command to bring blocks into a drawing.

14. Apply Principles of Orthographic and Multiview Projection

Linked Core Abilities
Demonstrate responsible and professional workplace behaviors
Integrate technology
Respect and appreciate diversity
Use mathematics effectively
Work cooperatively

Linked Program Outcomes
Prepare detail and assembly drawings for documentation of mechanical parts and machines using CAD (Computer-Aided Design) software using ASME Y14.5M-2009 Standard.
Function effectively on both self-directed and team-oriented projects.

Assessment Strategies
14.1. Drawing assignments
14.2. Written Assignment

Criteria

Criteria - Performance will be satisfactory when:
14.1. learner completes assignment in a lab setting
14.2. learner creates a freehand orthographic sketch of assigned objects.
14.3. learner creates multi-view drawings according to ANSI/ASME Y14.3 standards using AutoCAD.
14.4. learner averages 85% on all written assignments

Learning Objectives
14.a. Explain orthographic and multiview projection.
14.b. Identify the six primary views.
14.c. Identify normal, inclined, and oblique surfaces.
14.d. Sketch multiview drawings.
14.e. Create multi-view drawings to ANSI/ASME Y14.3 standards using AutoCAD.
14.f. Apply ASME Y14.2M standard line practices to multi-view drawings.