

Unit 32:

CAD for Maintenance Engineers

Unit code	F/615/1501
Unit level	4
Credit value	15

Introduction

There is a growing trend, in part due to the popularity of three-dimensional (3D) Computer Aided Design (CAD) systems, for students to generate two-dimensional (2D) drawings from three-dimensional (3D) solid models. 3D models do look impressive and whilst they clearly serve an important function in CAD design, in reality the vast majority of CAD drawings used in the industry are 2D based and, of those, a significant number are schematic drawings utilised by maintenance engineers, which cannot be produced using a 3D system.

The aim of this unit is to enable students to produce 2D CAD drawings (using industry standard CAD software), and to modify and construct electrical and mechanical drawings e.g. distribution systems, fire alarms, steam ranges, electrical and hydraulic circuits. This unit will support the development of the students' CAD abilities and build upon those skills to introduce the more advanced techniques that are used to create and modify schematic drawings quickly and efficiently. These techniques can be used to construct pre-prepared symbols for use in circuit diagrams, or be used to create unique symbols and symbol libraries.

Alongside the creation of schematic drawings utilising the block, attributes and insert commands, the students will also learn how to extract information to populate spreadsheets and databases, tabulating the information directly from the working drawing.

Learning Outcomes

By the end of this unit students will be able to:

1. Create and modify CAD drawings.
2. Construct, insert and export blocks with textual attributes.
3. Produce complex schematic drawings.
4. Transfer information to external sources.

Essential content

LO1 Create and modify CAD drawings

Introduction to the user interface:

Command line, Status Bar, panel titles and tabs

Recognise and apply absolute, relative and polar coordinates

Drafting aids:

Grid, snap, object snap, ortho and polar tracking

Draw commands:

Linetypes, circle, text, hatching, dimensioning

Modifying commands:

Copy, rotate, move, erase, scale, chamfer, fillet

Creating and defining text and dimension styles

Creating layers:

Layers/levels, colour

Viewing commands:

Zoom, pan, viewports and layouts

LO2 Construct, insert and export blocks with textual attributes

Creating and editing blocks and write blocks

Defining, editing and managing attributes

Inserting blocks from external sources

Attribute extraction

Dynamic and nested blocks

Using the design centre and tool palettes

LO3 **Produce complex schematic drawings**

Create block library and table legend, including symbols and description

Create electrical, electronic, hydraulic and pneumatic schematic drawings

LO4 **Transfer information to external sources**

Electronic transfer of information:

Data extraction and data extraction (DXE) files

Extracting data to tables and spreadsheets

Organise and refine the extracted data

Table styles and formatting data extraction tables

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Create and modify CAD drawings		D1 Evaluate the advantages of using template files
<p>P1 Identify the range of drawing aids that assist productivity</p> <p>P2 Produce a template file to include a range of layers, dimension styles, text styles, border and title box</p>	<p>M1 Contrast the advantages and disadvantages of using CAD over manual drafting</p>	
LO2 Construct, insert and export blocks with textual attributes		LO2 & LO3 D2 Validate how using attributes can improve productivity
<p>P3 Create ten schematic symbols</p> <p>P4 Add appropriate attribute data to each of the schematic symbols and convert into blocks</p>	<p>M2 Identify the advantages of using blocks in a drawing</p>	
LO3 Produce complex schematic drawings		
<p>P5 Produce a block library and table legend and integrate into a template file</p> <p>P6 Create a complex schematic drawing using electrical/electronic or hydraulic symbols</p>	<p>M3 Describe the advantages of using block libraries and how they can enhance templates</p>	

Pass	Merit	Distinction
LO4 Transfer information to external sources		D3 Assess how electronic transfer of information can aid productivity and provide example applications
P7 Extract attribute data to Excel spreadsheets P8 Explain the advantages of using data extraction (DXE) files	M4 Appraise the process for extracting drawing data to create a table	

Recommended Resources

Textbooks

OMURA, G. and BENTON, B.C. (2014) *Mastering AutoCAD 2015 and AutoCAD LT 2015 Essentials*. Autodesk Official Press.

ONSTOTT, S. (2014) *AutoCAD 2015 and AutoCAD LT 2015 Essentials*. Autodesk Official Press.

Websites

<https://knowledge.autodesk.com> Autodesk Knowledge Network
(Tutorials)

Links

This unit links to the following related units:

Unit 1: Engineering Design

Unit: 23 Computer Aided Design and Manufacture (CAD/CAM)