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

<table>
<thead>
<tr>
<th>LO1</th>
<th>Create and modify CAD drawings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P1</strong></td>
<td>Identify the range of drawing aids that assist productivity</td>
</tr>
<tr>
<td><strong>P2</strong></td>
<td>Produce a template file to include a range of layers, dimension styles, text styles, border and title box</td>
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<table>
<thead>
<tr>
<th>LO2</th>
<th>Construct, insert and export blocks with textual attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P3</strong></td>
<td>Create ten schematic symbols</td>
</tr>
<tr>
<td><strong>P4</strong></td>
<td>Add appropriate attribute data to each of the schematic symbols and convert into blocks</td>
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<table>
<thead>
<tr>
<th>LO3</th>
<th>Produce complex schematic drawings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P5</strong></td>
<td>Produce a block library and table legend and integrate into a template file</td>
</tr>
<tr>
<td><strong>P6</strong></td>
<td>Create a complex schematic drawing using electrical/electronic or hydraulic symbols</td>
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<tr>
<th>LO4</th>
<th>Transfer information to external sources</th>
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</thead>
<tbody>
<tr>
<td><strong>P7</strong></td>
<td>Extract attribute data to Excel spreadsheets</td>
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<tr>
<td><strong>P8</strong></td>
<td>Explain the advantages of using data extraction (DXE) files</td>
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<th><strong>Pass</strong></th>
<th><strong>Merit</strong></th>
<th><strong>Distinction</strong></th>
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<tr>
<td>P1</td>
<td>M1</td>
<td>D1</td>
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<tr>
<td>P2</td>
<td>M2</td>
<td>D2</td>
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<tr>
<td>M3</td>
<td>D3</td>
<td></td>
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</tbody>
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**P1** Identify the range of drawing aids that assist productivity

**P2** Produce a template file to include a range of layers, dimension styles, text styles, border and title box

**M1** Contrast the advantages and disadvantages of using CAD over manual drafting

**M2** Identify the advantages of using blocks in a drawing

**M3** Describe the advantages of using block libraries and how they can enhance templates

**P5** Produce a block library and table legend and integrate into a template file

**P6** Create a complex schematic drawing using electrical/electronic or hydraulic symbols

**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

**D3** Assess how electronic transfer of information can aid productivity and provide example applications

**D1** Evaluate the advantages of using template files

**D2** LO2 & LO3 Validate how using attributes can improve productivity
Recommended Resources

Textbooks

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)