

Unit 8: Engineering Design

Unit code: M/601/1475

QCF level: 5

Credit value: 15

- **Aim**

This unit will enable learners to prepare an engineering design specification that meets customer requirements and produce a final design report.

- **Unit abstract**

This unit will enable the learner to appreciate that design involves synthesising parameters that will affect the design solution. The learner will prepare a design specification against a customer's specific requirements. They will then prepare a design report that provides an analysis of possible design solutions, an evaluation of costs and an indication of how the proposed design meets the customer's specification. It is expected that the learner will, during the design processes, make full use of appropriate information and communication technology (ICT).

- **Learning outcomes**

On successful completion of this unit a learner will:

- 1 Be able to prepare a design specification to meet customer requirements
- 2 Be able to analyse and evaluate possible design solutions and prepare a final design report
- 3 Understand how computer-based technology is used in the engineering design process.

Unit content

1 Be able to prepare a design specification to meet customer requirements

Customer requirements: all relevant details of customer requirements are identified and listed eg aesthetics, functions, performance, sustainability, cost, timing and production parameters; all relevant regulations, standards and guidelines are identified and listed eg international, national, company policy and procedures, industry specific, statutory bodies

Design parameters: implications of specification parameters and resource requirements are identified and matched; the level of risk associated with each significant parameter is established

Design information: all relevant information is extracted from appropriate reference sources; techniques and technologies used in similar products or processes are identified; use of new technologies are specified where appropriate; relevant standards and legislation are identified and applied throughout; design specification is checked against customer requirements

2 Be able to analyse and evaluate possible design solutions and prepare a final design report

Analysis of possible design solutions: selection and use of appropriate analysis techniques to achieve a design solution eg matrix analysis, brainstorming, mind mapping, forced decision making, simulation

Evaluation of conceptual designs: costs; future development potential; value engineering concepts

Compliance check: eg using checklists and/or design review procedures

Final design report: communicate rationale for adopting proposed solution; use of appropriate techniques and media in the presentation of the report eg sketches, charts, graphs, drawings, spreadsheets/databases, computer aided design (CAD), desk top publishing (DTP), word-processing

3 Understand how computer-based technology is used in the engineering design process

Key features of computer-aided design systems: 2D design and 3D modelling systems eg accessing standards, parts and material storage and retrieval, engineering calculations, PCB layouts, integrated circuit design, circuit and logic simulation (including ac, dc and transient analysis, schematic capture)

CAD software: accessing and using appropriate design software eg parts assembly, pipe-work and ducting layouts, networks, planned maintenance, scheduling, planning, stress and strain, heat transfer, vibration analysis, resource utilisation, plant layout, costing, circuit emulation, plant electrical services, for example, finite element analysis and printed-circuit board analysis software

Software evaluation: consideration of costs, compatibility and function

Learning outcomes and assessment criteria

Learning outcomes On successful completion of this unit a learner will:	Assessment criteria for pass The learner can:
LO1 Be able to prepare a design specification to meet customer requirements	1.1 establish customer requirements 1.2 present the major design parameters 1.3 obtain design information from appropriate sources and prepare a design specification 1.4 demonstrate that the design specification meets requirements
LO2 Be able to analyse and evaluate possible design solutions and prepare a final design report	2.1 produce an analysis of possible design solutions 2.2 produce and evaluate conceptual designs 2.3 select the optimum design solution 2.4 carry out a compliance check 2.5 produce a final design report
LO3 Understand how computer-based technology is used in the engineering design process	3.1 explain the key features of a computer-aided design system 3.2 use computer-aided design software to produce a design drawing or scheme 3.3 evaluate software that can assist the design process.

Guidance

Links

This unit can be linked with *Unit 2: Engineering Science* and *Unit 3: Project Design, Implementation and Evaluation*.

The unit can also be linked with the SEMTA Level 4 National Occupational Standards in Engineering Management, particularly Unit 4.12: Create Engineering Designs and Unit 4.13: Evaluate Engineering Designs.

Essential requirements

Access to suitable software packages will need to be available. These could include packages for computer-aided design, assembly procedures, critical path, plant layout, planned maintenance, utilisation, material selection, standard component and matrix analysis.

Employer engagement and vocational contexts

Delivery of this unit would benefit from visits to an engineering design facility or the attendance of guest speaker(s) with experience of engineering design in a relevant industrial environment.