

Unit 4: Managing a Professional Engineering Project

Unit code	A/615/1478
Unit type	Core
Unit level	4
Credit value	15

Introduction

The responsibilities of the engineer go far beyond completing the task in hand. Reflecting on their role in a wider ethical, environmental and sustainability context starts the process of becoming a professional engineer – a vital requirement for career progression.

Engineers seldom work in isolation and most tasks they undertake require a range of expertise, designing, developing, manufacturing, constructing, operating and maintaining the physical infrastructure and content of our world. The bringing together of these skills, expertise and experience is often managed through the creation of a project.

This unit introduces students to the techniques and best practices required to successfully create and manage an engineering project designed to identify a solution to an engineering need. While carrying out this project students will consider the role and function of engineering in our society, the professional duties and responsibilities expected of engineers together with the behaviours that accompany their actions.

Among the topics covered in this unit are: roles, responsibilities and behaviours of a professional engineer, planning a project, project management stages, devising solutions, theories and calculations, management using a Gantt chart, evaluation techniques, communication skills, and the creation and presentation of a project report.

On successful completion of this unit students will be able to conceive, plan, develop and execute a successful engineering project, and produce and present a project report outlining and reflecting on the outcomes of each of the project processes and stages. As a result, they will develop skills such as critical thinking, analysis, reasoning, interpretation, decision-making, information literacy, and information and communication technology, and skills in professional and confident self-presentation.

This unit is assessed by a Pearson-set assignment. The project brief will be set by the centre, based on a theme provided by Pearson (this will change annually). The theme and chosen project within the theme will enable students to explore and examine a relevant and current topical aspect of professional engineering. Students will undertake this project individually.

Learning Outcomes

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

1. Formulate and plan a project that will provide a solution to an identified engineering problem, with reference to national and international engineering regulatory regimes and ethical frameworks.
2. Conduct planned project activities to generate outcomes which provide a solution to the identified engineering problem, with reference to ethical frameworks, health and safety requirements and professional standards of behaviour in engineering.
3. Produce a project report analysing the outcomes of each of the project processes and stages.
4. Present the project report and reflect on the value gained from conducting the project and potential improvements in future projects.

Essential Content

LO1 **Formulate and plan a project that will provide a solution to an identified engineering problem, with reference to national and international engineering regulatory regimes, and ethical frameworks**

Examples of realistic engineering based problems:

Crucial considerations for the project.

How to identify the nature of the problem through vigorous research.

Feasibility study to identify constraints and produce an outline specification.

Develop an outline project brief and design specification:

Knowledge theories, calculations and other relevant information that can support the development of a potential solution.

Ethical frameworks:

The Engineering Council and Royal Academy of Engineering's Statement of Ethical Principles

The National Society for Professional Engineers' Code of Ethics

Regulatory bodies:

Global, European and national influences on engineering and the role of the engineer, in particular: The Royal Academy of Engineering and the UK Engineering Council.

The role and responsibilities of the UK Engineering Council and the Professional Engineering Institutions (PEIs).

The content of the UK Standard for Professional Engineering Competence (UKSPEC).

Chartered Engineer, Incorporated Engineer and Engineering Technician.

International regulatory regimes and agreements associated with professional engineering:

European Federation of International Engineering Institutions.

European Engineer (Eur Eng).

European Network for Accreditation of Engineering Education.

European Society for Engineering Education.

Washington Accord.

Dublin Accord.

Sydney Accord.

International Engineers Alliance.

Asia Pacific Economic Cooperation (APEC) Engineers Agreement.

L02 Conduct planned project activities to generate outcomes which provide a solution to the identified engineering problem, with reference to ethical frameworks, health and safety requirements and professional standards of behaviour in engineering

Project execution phase:

Continually monitoring development against the agreed project plan and adapt the project plan where appropriate.

Work plan and time management, using Gantt chart or similar.

Tracking costs and timescales.

Maintaining a project diary to monitor progress against milestones and timescales.

Engineering professional behaviour sources:

Professional responsibility for health and safety (UK-SPEC).

Professional standards of behaviour (UK-SPEC).

Ethical frameworks:

The Engineering Council and Royal Academy of Engineering's Statement of Ethical Principles.

The National Society for Professional Engineers' Code of Ethics.

L03 Produce a project report analysing the outcomes of each of the project processes and stages

Convincing arguments:

All findings/outcomes should be convincing and presented logically where the assumption is that the audience has little or no knowledge of the project process.

Critical analysis and evaluation techniques:

Most appropriate evaluation techniques to achieve a potential solution.

Secondary and primary data should be critiqued and considered with an objective mindset.

Objectivity results in more robust evaluations where an analysis justifies a judgement.

L04 Present the project report and reflect on the value gained from conducting the project and potential improvements in future projects

Presentation considerations:

Media selection, what to include in the presentation and what outcomes to expect from it. Audience expectations and contributions.

Presentation specifics. Who to invite: project supervisors, fellow students and employers. Time allocation, structure of presentation.

Reflection on project outcomes and audience reactions.

Conclusion to report, recommendations for future work, lessons learned, changes to own work patterns.

Reflection for learning and practice:

The difference between reflecting on performance and evaluating a project – the former considers the research process, information gathering and data collection, the latter the quality of the research argument and use of evidence.

The cycle of reflection:

To include reflection in action and reflection on action.

How to use reflection to inform future behaviour, particularly directed towards sustainable performance.

The importance of Continuing Professional Development (CPD) in refining on-going professional practice.

Reflective writing:

Avoiding generalisation and focusing on personal development and the research journey in a critical and objective way.

Learning Outcomes and Assessment Criteria

Pass		Merit	Distinction
<p>L01 Formulate and plan a project that will provide a solution to an identified engineering problem, with reference to national and international engineering regulatory regimes, and ethical frameworks</p>			<p>D1 Illustrate the effect of legislation and ethics on the decision-making process in developing the project plan.</p>
<p>P1 Select an appropriate engineering based project, giving reasons for the selection.</p> <p>P2 Create a project plan for each process involved.</p>	<p>M1 Undertake a feasibility study to justify project selection.</p>		
<p>L02 Conduct planned project activities to generate outcomes which provide a solution to the identified engineering problem, with reference to ethical frameworks, health and safety requirements and professional standards of behaviour in engineering</p>			<p>D2 Critically evaluate own behaviours while working on the project, with reference to ethics, health and safety and professional standards of behaviour in engineering (using a reflective log).</p>
<p>P3 Conduct project activities, recording progress against original project plan.</p>	<p>M2 Explore alternative methods to monitor and meet project milestones, justify selection of chosen method(s).</p>		
<p>L03 Produce a project report analysing the outcomes of each of the project processes and stages</p>			<p>D3 Critically evaluate the success of the project plan, including own behaviours and performance, and make recommendations for improvement.</p>
<p>P4 Produce a clearly structured and coherent project report covering each stage of the project and analysing project outcomes.</p>	<p>M3 Use appropriate critical analysis and evaluation techniques to analyse project findings.</p>		

Pass	Merit	Distinction
<p>L04 Present the project report and reflect on the value gained from conducting the project and potential improvements in future projects</p>		
<p>P5 Select the most appropriate method of presenting the project outcomes.</p> <p>P6 Present the project report describing challenges for completion and value gained, in a structured and coherent manner.</p>	<p>M4 Evaluate the success of the project and make justified improvements in future projects around identified challenges.</p> <p>M5 Analyse own behaviours and performance during the project and reflect on areas for improvement in future behaviour and performance.</p>	

Recommended Resources

Textbooks

PUGH, P. S. (1990) *Total Design: Integrated Methods for Successful Product Engineering*. Prentice Hall.

STRIEBIG, B., OGUNDIPE, A. and PAPADAKIS, M. (2015) *Engineering Applications in Sustainable Design and Development*. Cengage Learning.

ULRICH, K. and EPPINGER, S. (2011) *Product Design and Development*. 5th Ed. McGraw-Hill Higher Education.

Journals

Journal of Engineering Design.

Links

This unit links to the following related units:

Unit 34: Research Project

Unit 35: Professional Engineering Management