

Unit 4004: Managing a Professional Engineering Project

Unit Code: L/651/0712

Level: 4

Credits: 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/manufacturing 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 theme. 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.

***Please refer to the accompanying Pearson-set Assignment Guide and the Theme Release document for further support and guidance on the delivery of the Pearson-set unit.**

Learning Outcomes

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

- LO1 Select a project that will provide a solution to an identified engineering/manufacturing problem.
- LO2 Conduct planned project activities to generate outcomes which provide a solution to the identified engineering/manufacturing problem.
- LO3 Produce a project report analysing the outcomes of each of the project processes and stages.
- LO4 Present the project report drawing conclusions on the outcomes of the project.

Essential Content

LO1 **Select a project that will provide a solution to an identified engineering/manufacturing problem**

Engineering projects:

Overview of project management

Examples of realistic engineering/manufacturing-based problems

Grand engineering/manufacturing challenges (e.g., regional, global, sector, society); relevant case studies

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

Project management techniques – Strengths, Weaknesses, Opportunities, Threats (SWOT), stakeholder matrices, risk mapping, radar chart, and summary risk profiles.

Team-driven problem solving: positive, professional, respectful, trusting and ethical working relationships. Impact of human factors (i.e., organisational, environment and job factors) on individual/team behaviours and performance. Team support (e.g., coaching/mentoring, feedback, opportunities). Organisational vision and goals. Holistic stakeholder engagement.

Develop an outline project brief and design specification:

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

Project selection relevant to occupation/sector of interest/programme of study (e.g., mechanical, electrical, manufacturing, aeronautical, operations, space, marine, Industry 4.0, automation, computer systems etc.).

Ethical frameworks:

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

The National Society for Professional Engineers' Code of Ethics.

Professional, Statutory and Regulatory Bodies (PSRBs):

Global, national, and regional influences on engineering/manufacturing, and the role of the engineer. For example: The Royal Academy of Engineering and the UK Engineering Council.

The role and responsibilities of the PSRBs. For example, UK Engineering Council and the Professional Engineering Institutions (PEIs)

Roles: Chartered Engineer, Incorporated Engineer, and Engineering Technician, other professional body membership roles, requirements for eligibility and responsibilities

Standards and content of the standards. For example, the content of the UK Standard for Professional Engineering Competence (UKSPEC)

Occupational standards and alignment with knowledge, skills, and behaviours of a chosen occupation.

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

International Council on Systems Engineering

The Institute of Industrial and Systems Engineers (IISE)

Washington Accord

Dublin Accord

Sydney Accord

International Engineers Alliance

Asia Pacific Economic Cooperation (APEC) Engineers Agreement.

LO2 Conduct planned project activities to generate outcomes which provide a solution to the identified engineering/manufacturing problem

Project execution phase:

Continually monitoring development against the agreed project plan and adapting the project plan where appropriate

Work plan and time management, using Gantt chart or similar. Prioritisation of workload/time management techniques to achieve personal and team objectives. Role of KPIs.

Integrated quality control checks (including risk assessments and resolutions)

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 (e.g., UK-SPEC)

Professional standards of behaviour (e.g., UK-SPEC)

Relevant government and organisational policies, legal requirements (e.g., employment law, equality law), implications, and compliance.

Ethical frameworks:

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

The National Society for Professional Engineers' Code of Ethics.

LO3 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

Use of data collection systems, data formats, and dashboards 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 and decision making.

LO4 Present the project report drawing conclusions on the outcomes of the project

Presentation considerations:

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

Presentation specifics. Audience: project supervisors, fellow students and employers and others involved. 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 ongoing professional practice. Reflecting on competencies gained. Keeping abreast of developments in engineering/manufacturing processes manufacturing and emerging technologies through reskilling/upskilling (e.g., digital competencies, sustainability goals).

Reflective writing:

Avoiding generalisation and focusing on personal development and the research journey critically and objectively.

Learning Outcomes and Assessment Criteria

Pass		Merit	Distinction
LO1 Select a project that will provide a solution to an identified engineering/manufacturing problem			D1 Illustrate the effect of legislation and ethics in developing the project plan.
P1 Select an appropriate engineering/manufacturing-based project, giving reasons for the selection	P2 Create a project plan for the engineering/manufacturing project.	M1 Undertake a feasibility study to justify project selection.	
LO2 Conduct planned project activities to generate outcomes which provide a solution to the identified engineering/manufacturing problem			D2 Critically evaluate the success of the project plan, making recommendations for improvement.
P3 Conduct project activities, recording progress against the original project plan.		M2 Explore alternative methods to monitor and meet project milestones, and justify selection of chosen method(s).	
LO3 Produce a project report analysing the outcomes of each of the project processes and stages			LO3 and LO4 D3 Critically analyse the project outcomes, making recommendations for further development.
P4 Produce a project report covering each stage of the project and analysing project outcomes.		M3 Use appropriate critical analysis and evaluation techniques to analyse project findings.	
LO4 Present the project report drawing conclusions on the outcomes of the project			
P5 Present the project activities and outcomes using appropriate media to an audience.		M4 Analyse own behaviours and performance during the project activities and suggest areas for improvement	

Recommended Resources

Note: See HN Global for guidance on additional resources.

Print Resources

Aucoin B.M. (2018) *From Engineer to Manager: Mastering the Transition*. Second Edition Hardcover – Unabridged. Artech House.

Del Pont J.P. (2012) *Process Engineering and Industrial Management*. Wiley.

Kerzner H. (2023) *Project Management Metrics, KPIs, and Dashboards: A Guide to Measuring and Monitoring Project Performance*. 4th Edition. Wiley.

Kerzner H. (2022) *Innovation Project Management: Methods, Case Studies, and Tools for Managing Innovation Projects*. 2nd Edition. Wiley.

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

Note: Example journals listed below provide a broad range of articles related to unit content and those relevant for the qualification. Staff and students are encouraged to explore these journals and any other suitable journals to support the development of academic study skills, and subject specific knowledge and skills as part of unit level delivery.

[Engineering Management](#)

[Engineering Management Journal](#)

[Frontiers of Engineering Management](#)

[IEEE Transactions on Engineering Management](#)

[International Journal of Engineering and Technology](#)

[Journal of Engineering Design](#)

[Journal of Engineering, Design and Technology](#)

[Journal of Engineering and Technology Management](#)

[Journal of Manufacturing Technology Management](#)

[Journal of Management & Organization](#)

[Microelectronic Engineering](#)

[Probability in the Engineering and Information Sciences](#)

[Probabilistic Engineering Mechanics](#)

[Results in Engineering](#)

Links

This unit links to the following related units:

Unit 5001: Research Project

Unit 5002: Professional Engineering Management