Unit 12: Engineering Management

Unit code Y/615/1486
Unit level 4
Credit value 15

Introduction
Managing engineering projects is one of the most complex tasks in engineering. Consider the mass production of millions of cars, sending a man or women into space or extracting oil or gas from deep below the surface of the earth. Bringing the materials and skills together in a cost effective, safe and timely way is what engineering management is all about.

This unit introduces students to engineering management principles and practices, and their strategic implementation.

Topics included in this unit are: the main concepts and theories of management and leadership, fundamentals of risk management, operational management, project and operations management theories and tools, the key success measures of management strategies, and planning tools.

On successful completion of this unit students will be able to investigate key strategic issues involved in developing and implementing engineering projects and solutions, and explain professional codes of conduct and the relevant legal requirements governing engineering activities.

Learning Outcomes
By the end of this unit students will be able to:
1. Examine the application of management techniques, and cultural and leadership aspects to engineering organisations.
2. Explore the role of risk and quality management in improving performance in engineering organisations.
3. Investigate the theories and tools of project and operations management when managing activities and optimising resource allocation.
4. Perform activities that improve current management strategies within an identified element of an engineering organisation.
Essential Content

LO1 **Examine the application of management techniques, and cultural and leadership aspects to engineering organisations**

*Main concepts and theories of management and leadership:*
- Influence on organisational culture and communication practices
- Effect of change within an organisation on its culture and behaviour

*Management and leadership theories:*
- Managerial behaviour and effectiveness
- Organisational culture and change
- Organisational communication practices

LO2 **Explore the role of risk and quality management in improving performance in engineering organisations**

*Fundamentals of quality management:*
- Introduction to monitoring and controlling
- Most appropriate quality improvement methodologies and practices for different business areas, projects and processes in order to lower risk and improve processes

*Risk and quality management:*
- Risk management processes
- Risk mapping and risk matrix
- Quality management theories
- Continuous improvement practices
- Principles, tools and techniques of Total Quality Management (TQM)

LO3 **Investigate the theories and tools of project and operations management when managing activities and optimising resource allocation**

*Operation management:*
- Main areas and stages of projects and operations management
- Most important methodologies focusing on eliminating waste and smoothing the process flows without scarifying quality
Project and operations management theories and tools:
Project appraisal and life cycle
Logistics and supply chain management
Operations management
Resources management
Sustainability
Legal requirements governing employment, health, safety and environment

LO4 Perform activities that improve current management strategies within an identified element of an engineering organisation

The key success of management strategies:
Following processes from end to end, from suppliers to customers
Identifying areas critical for the success of a project or process

Planning tools:
Gantt charts
Flow charts
Critical analysis and evaluation
## Learning Outcomes and Assessment Criteria

<table>
<thead>
<tr>
<th>LO1</th>
<th>Examine the application of management techniques, and cultural and leadership aspects to engineering organisations</th>
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<tbody>
<tr>
<td>P1</td>
<td>Explain management and leadership theories and techniques used within engineering organisations</td>
</tr>
<tr>
<td>M1</td>
<td>Justify different management techniques with emphasis on cultural and leadership aspects and their applications to engineering organisations</td>
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<td>D1</td>
<td>Propose recommendations for the most efficient application of management techniques</td>
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<tr>
<th>LO2</th>
<th>Explore the role of risk and quality management in improving performance in engineering organisations</th>
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<tbody>
<tr>
<td>P2</td>
<td>Describe the role and importance of risk and quality management processes and their impact on engineering organisations</td>
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<tr>
<td>M2</td>
<td>Explain how risk and quality management strategies encourage performance improvements within engineering organisations</td>
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<tr>
<td>D2</td>
<td>Provide supported and justified recommendations for the most efficient and effective risk and quality management practices</td>
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<tr>
<th>LO3</th>
<th>Investigate the theories and tools of project and operations management when managing activities and optimising resource allocation</th>
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<tbody>
<tr>
<td>P3</td>
<td>Identify project and operations management tools used when managing activities and resources within the engineering industry</td>
</tr>
<tr>
<td>M3</td>
<td>Analyse the most effective project and operations management tools used when managing activities and optimising resource allocation</td>
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<tr>
<td>D3</td>
<td>Analyse the relative merits of theories and tools of project and operations management, with a focus on their relevance when managing activities and optimising resource allocation</td>
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<tr>
<th>LO4</th>
<th>Perform activities that improve current management strategies within an identified element of an engineering organisation</th>
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<tr>
<td>P4</td>
<td>Define the range of processes available to improve management processes within an engineering organisation</td>
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<tr>
<td>M4</td>
<td>Explore activities that will improve management strategies within an engineering organisation</td>
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<tr>
<td>D4</td>
<td>Conduct a full analysis of the management processes within an engineering organisation (or case study) and make fully justified recommendations for improvements to the management strategies</td>
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Recommended Resources

Textbooks

Websites
http://strategicmanagement.net/ Strategic Management Society (General Reference)
http://www.journals.elsevier.com/ Elsevier Journal of Operations Management (Journal)

Links
This unit links to the following related units:
Unit 4: Managing a Professional Engineering Project
Unit 35: Professional Engineering Management