UNIVERSITY OF LINCOLN

Programme Specification

Title:

Mechanical Engineering

Final Award: **Master of Science (MSc)**

With Exit Awards at:
Postgraduate Certificate (PG Cert)
Postgraduate Diploma (PG Dip)
Master of Science (MSc)

To be delivered from: 21 Sep 2014

Level	Date
Masters or Postgraduate Certificate (PG Cert)	2017-18
Masters or Postgraduate Diploma (PG Dip)	2017-18
Masters or Master of Science (MSc)	2017-18

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1. Introduction

This document describes one of the University of Lincoln's programmes using the protocols required by the UK National Qualifications Framework as defined in the publication *QAA guidelines for preparing programme specifications*.

This programme operates under the policy and regulatory frameworks of the University of Lincoln.

2. Basic Programme Data

Final Award:	Master of Science (MSc)
Programme Title:	Mechanical Engineering
Exit Awards and Titles	Postgraduate Certificate (PG Cert) Postgraduate Diploma (PG Dip) Master of Science (MSc)
Subject(s)	Engineering
Mode(s) of delivery	Full Time Part Time
Is there a Placement or Exchange?	No
UCAS code	
Awarding Body	University of Lincoln
Campus(es)	Lincoln Campus
School(s)	School of Engineering
Programme Leader	Colin Dowding (cdowding)
Relevant Subject Benchmark Statements	
Professional, Statutory or Regulatory Body Accreditation	
Programme Start Date	2017-18

3. Programme Description

3.1 Overview

The advancement of civilization has been mirrored by and dependent upon increased use of power and energy. This MSc in Mechanical Engineering at the Lincoln School of Engineering is designed to deliver graduates to industry with a broad understanding of mechanical engineering, with a focus on power generation and the associated control and economics that make such technologies successful. Successful graduates will have gained the necessary knowledge and skills to meet the challenge and generate power and energy in the 21st Century. Students can enrol on the programme either full-time (1 year) or part-time (2 years). Applications are welcome from graduates achieving a good first degree (minimum lower second class honours) in Mechanical Engineering or a closely related discipline, or a good first degree (minimum lower second class honours) in a physical science.

3.2 Aims and Objectives

Progress in the 21st century will be dependent upon power and energy, but the generation will have to be on a more sustainable basis. The main aim of the MSc in Mechanical Engineering is to take engineers and equip them with the ability to succeed in one of the 21st century's most pressing issues: the generation of power and energy from a sustainable basis. The spread of topics provides an holistic taught delivery, supported by the School's excellent links with relevant local and global industries to ensure that graduates of this MSc will not only be in demand by a wide spectrum of organizations, but will be critical thinkers and independent learners, ready to meet the challenges of modern power production. The other aims of this programme are:

• To produce graduates who can systematically and creatively deal with complex issues in mechanical engineering, specifically control and power and energy, and make sound judgements;
• To produce graduates that can communicate their conclusions to specialist and non-specialist audiences;
• To produce graduates who have self-direction and originality in tackling and solving problems;
• To produce graduates who act autonomously in planning and implementing tasks at a professional level;
• To offer a timely and industrially relevant degree programme that places the student's learning experience at the centre of every activity;
• To provide specific knowledge and understanding of the aspects of mechanical engineering that are relevant to sustainable power and energy that are informed by the research activities of the academic staff;
• To produce graduates with the ability to apply systems thinking and conduct systems analysis;
To produce graduates who are well prepared for a career in mechanical engineering.

3.3 Variations to Standard Regulations and Guidance

None

4. Programme Outcomes

Programme-level learning outcomes are identified below.

Refer to *Appendix I – Curriculum Map* for details of how outcomes are deployed across the programme.

4.1 Knowledge and Understanding

On successful completion of this programme a student will have knowledge and understanding of:

1 knowledge and understanding of the fundamental scientific and technical aspects of advanced mechanical engineering science, with focuses on power and energy engineering and control systems.

2 knowledge and understanding of the changing nature of technologies with respect to power and energy production

3 Knowledge and understanding of the limitations of current knowledge and the need to gain new knowledge through advanced scholarship and further study, research and team-based project work.

4 Knowledge and understanding of the procedures and behaviours in professional engineering practice.

4.2 Subject Specific Intellectual Skills

On successful completion of this programme a student will be able to:

5 Able to deal with complex issues both systematically and creatively, and make sound judgements in the absence of complete data.

6 demonstrate a systematic understanding of knowledge and a critical awareness of mechanical engineering, with a focus on current power and energy, and control issues

7 Able to apply a conceptual understanding that enables evaluation of methodologies and the ability to propose new hypotheses.

8 Able to sythnesize and analyse information and ideas from a range of different types of information (including current research, technical manuals and standards) and apply creative and original thought in order to propose new solutions to complex and non-standard problems.

4.3 Subject Specific Practical Skills

On successful completion of this programme a student will be able to:

9 Able to collect, record, analyse and critically interpret data.

10 Demonstrate competence in using a range of techniques applicable to professional practice.

11 Able to plan and conduct a scientific investigation using a wide range of technical and other literature: demonstrating practical laboratory skills associated with the relevant modules; and demonstrating skills in research planning, and execution and technical writing through

completion of the research project.

12 Demonstrate competent computing skills by using commercial computer software for modelling, analysis and design.

4.4 Transferable Skills and Attributes

On successful completion of this programme a student will be able to:

13 Demonstrate effective independent learning and the ability to perform complex tasks to a high level.

14 Able to apply a systematic approach to problem solving, demonstrating creativity and innovation.

15 Demonstrate a high level of competency in the skills of analysis and critical evaluation.

16 Able to plan, budget, organize, direct and control tasks, people and resources either individually or in collaboration with others and communicate at an advanced level to a variety of audiences.

17 Be ready and prepared for their careers and committed to maintaining a high professional and ethical standard in their profession.

For details of each module contributing to the programme, please consult the module specification document.

5. Learning, Teaching and Assessment Strategies

5.1. Learning and Teaching Strategy

The teaching and learning strategies aim to ensure that learning empowers the students to improve their levels of informed and independent critical analysis and idea dissemination. The most commonly adopted methods for achieving these aims consist of:

• Lectures are the primary means of conveying an academic overview of a particular topic area. This will be re-enforced and expanded through worked examples and/or case studies, a key element of which will be plenary discussion. In this way students will gain from multiple viewpoints in the topic area, and experience in developing and defending coherent argument. Students will also be expected to use a range of ICT in enabling them to develop their understanding of the subject matter during their studies.
• Tutorials and case studies are normally delivered to smaller (than class sized) groups of students. These classes provide an opportunity for academic staff to resolve problems in the students' understanding.
• Laboratory Classes are used to introduce experimental techniques and practical methods. They provide an excellent opportunity for students to practice team-working and communication skills.
• VLE Provision is via the University's established Blackboard system. As well as the posting of lecture and tutorial material, Blackboard will be used to host on-line discussions, useful videos and quizzes.
• Open assignments are used in a number of modules where students are required to seek additional information so that they can develop and demonstrate their understanding of the course material. Students will be required to work independently or in small groups.
• Oral and Poster Presentations may be included as part of coursework assignments. These presentations allow students to develop such communication skills.
• Formative Assessments do contribute to the final marks achieved for each module and also provide an opportunity for students to develop their critical evaluation skills and to monitor their own academic progress. They also provide a useful opportunity for lecturers to give feedback to the students and to monitor and improve the students' learning experience. These assessments will take the form of diagnostic tests, in-class tests and on-line tests during lectures; as well as evaluation and discussions relating to logbooks and equipment during laboratory classes. Students will have opportunities to develop their oral and presentation skills during tutorials and workshops.
• Individual Research Project is completed in the latter part of the degree programme. This project represents a substantial, individual research project on an aspect of Mechanical Engineering. It is conducted under the supervision of a member of staff. This project provides excellent opportunity for the student to pull together aspects of their development achieved during the programme.
Wherever possible the School will make the maximum use of industry-university links so that graduates will be aware of modern commercial and managerial practices appropriate to the engineering industry. This includes industrial speakers, factory tours and engagement in real engineering projects set by industrial collaborators, in-line with Student as Producer principles. The School is constantly reviewing its delivery mechanisms in order to identify further opportunities to embed these Student as Producer principles in order to enhance student learning. Resulting from this engagement and constant exposure to industry research, by virtue of the links of the Lincoln School of Engineering, the graduates of this MSc will gain practical as well as academic skills, of value to the employer.

5.2. Assessment Strategy

The assessment strategy adopted within the MSc Mechanical Engineering reflects the programme's

emphasis on applied practice and the development of a range of skills. In all assessments students will be expected to demonstrate an appropriate level of understanding of the relevant theoretical issues. The design of the assessment strategy has regard for the following factors:

• Coursework Assignments, Laboratory Reports, Technical Reports, Oral and Poster Presentations may be used throughout the degree programme. They constitute the major form of assessment for most modules. Coursework assignments are designed to give students the opportunity to demonstrate their understanding of the course material (particularly when the student is required to seek additional information). Students are also able to demonstrate their presentation and communication skills. Assignments can be conducted on an individual basis or in small groups.

• Computer Based Tests and Assessed Simulations are used in modules that involve a substantial computer-based element. These assessments give the students an opportunity to demonstrate their proficiency in a simulated professional situation.

• Peer Assessment will be used in modules that involve a substantial team-working element. Normally, students will moderate the final marks for the group project to reflect the contributions of different team member to encourage full an equal participation by each student. Students may also peer review other students' coursework to develop their critical thinking skills, but this case the quality of the peer review is assessed.

• The Individual Research Project/ Dissertation is the largest individual project and is undertaken during the summer of the degree programme. The project is assessed via a written dissertation, a conference style oral presentation and the student's response to questions. It will be at a professional level.

6. Programme Structure

The total number of credit points required for the achievement of Postgraduate Certificate (PG Cert) is 60.
The total number of credit points required for the achievement of Postgraduate Diploma (PG Dip) is 120.
The total number of credit points required for the achievement of Master of Science (MSc) is 180.

Masters

Title	Credit Rating	Core / Optional
Machines in Power Generation 2017-18	15	Optional
Industrial Turbo-machinery 2017-18	15	Optional
Combustion and Sustainable Fuels 2017-18	15	Core
Engineering Research Project 2017-18	60	Core
Project Management 2020-21	15	Core
Sustainable Energy Systems 2020-21	15	Core
Applied Thermo-fluids Systems 2017-18	15	Core
Applied Computational Fluid Dynamics 2017-18	15	Optional
Applied Finite Element Analysis 2017-18	15	Optional
Sensors, Actuators and Controllers 2017-18	15	Optional
Vibration and Acoustic Analysis of Systems 2017-18	15	Optional
Intelligent Systems and Control 2017-18	15	Optional

Appendix I - Curriculum Map

This table indicates which modules assume responsibility for delivering and ordering particular programme learning outcomes.

Key: ✓ Delivered and Assessed Delivered ✓ Assessed

Masters

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Applied Computational Fluid Dynamics 2017-18	✓		✓		✓		✓	✓	✓	✓		✓
Applied Finite Element Analysis 2017-18	✓		✓		✓		✓	✓	✓	✓		✓
Applied Thermo-fluids Systems 2017-18	✓	✓	✓	✓		✓		✓			✓	
Combustion and Sustainable Fuels 2017-18	✓	✓	✓		✓	✓	✓	✓	✓		✓	
Engineering Research Project 2017-18	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Industrial Turbo-machinery 2017-18		✓		✓	✓			✓	✓	✓	✓	✓
Intelligent Systems and Control 2017-18	✓	✓		✓	✓			✓	✓	✓		
Machines in Power Generation 2017-18	✓	✓	✓	✓	✓	✓	✓	✓				
Project Management 2020-21			✓	✓				✓		✓	✓	
Sensors, Actuators and Controllers 2017-18	✓	✓			✓	✓		✓	✓	✓		✓
Sustainable Energy Systems 2020-21	✓	✓	✓	✓	✓			✓		✓		
Vibration and Acoustic Analysis of Systems 2017-18	✓	✓		✓	✓			✓	✓	✓		

	PO13	PO14	PO15	PO16	PO17
Applied Computational Fluid Dynamics 2017-18	✓	✓	✓		
Applied Finite Element Analysis 2017-18	✓	✓	✓		
Applied Thermo-fluids Systems 2017-18	✓	✓	✓		✓
Combustion and Sustainable Fuels 2017-18	✓	✓	✓		✓
Engineering Research Project 2017-18	✓	✓	✓	✓	✓
Industrial Turbo-machinery 2017-18	✓	✓	✓		✓
Intelligent Systems and Control 2017-18	✓				✓

Machines in Power Generation 2017-18	✓	✓			✓
Project Management 2020-21	✓	✓	✓	✓	✓
Sensors, Actuators and Controllers 2017-18	✓				✓
Sustainable Energy Systems 2020-21	✓	✓	✓		✓
Vibration and Acoustic Analysis of Systems 2017-18	✓				✓

Appendix II - Assessment Map

This table indicates the spread of assessment activity across the programme. Percentages indicate assessment weighting.

Masters

	01	02	03	04	05	06	07	08	09	10	11	12
Applied Computational Fluid Dynamics 2017-18												
Applied Finite Element Analysis 2017-18												
Applied Thermo-fluids Systems 2017-18												
Combustion and Sustainable Fuels 2017-18												
Engineering Research Project 2017-18												
Industrial Turbo-machinery 2017-18												
Intelligent Systems and Control 2017-18												
Machines in Power Generation 2017-18												
Project Management 2020-21												
Sensors, Actuators and Controllers 2017-18												
Sustainable Energy Systems 2020-21												
Vibration and Acoustic Analysis of Systems 2017-18												

	13	14	15	16	17	18	19	20	21	22	23	24
Applied Computational Fluid Dynamics 2017-18											100	
Applied Finite Element Analysis 2017-18											100	
Applied Thermo-fluids Systems 2017-18												
Combustion and Sustainable Fuels 2017-18												
Engineering Research Project 2017-18												
Industrial Turbo-machinery 2017-18												
Intelligent Systems and Control 2017-18												
Machines in Power Generation 2017-18								100				

Project Management 2020-21								50				
Sensors, Actuators and Controllers 2017-18									100			
Sustainable Energy Systems 2020-21												100
Vibration and Acoustic Analysis of Systems 2017-18											25	

	25	26	27	28	29	30	31	32	33	34	35	36
Applied Computational Fluid Dynamics 2017-18												
Applied Finite Element Analysis 2017-18												
Applied Thermo-fluids Systems 2017-18		100										
Combustion and Sustainable Fuels 2017-18	100											
Engineering Research Project 2017-18												
Industrial Turbo-machinery 2017-18			100									
Intelligent Systems and Control 2017-18			60									
Machines in Power Generation 2017-18												
Project Management 2020-21												
Sensors, Actuators and Controllers 2017-18												
Sustainable Energy Systems 2020-21												
Vibration and Acoustic Analysis of Systems 2017-18												

	37	38	39	40	41	42	43	44	45	46	47	48
Applied Computational Fluid Dynamics 2017-18												
Applied Finite Element Analysis 2017-18												
Applied Thermo-fluids Systems 2017-18												
Combustion and Sustainable Fuels 2017-18												
Engineering Research Project 2017-18												100
Industrial Turbo-machinery 2017-18												
Intelligent Systems and Control 2017-18												
Machines in Power Generation 2017-18												
Project Management 2020-21												

Sensors, Actuators and Controllers 2017-18												
Sustainable Energy Systems 2020-21												
Vibration and Acoustic Analysis of Systems 2017-18												

	49	50	51	52	EP 1 (Wk 16)	EP 2 (Wks 33, 34, 35)
Applied Computational Fluid Dynamics 2017-18						
Applied Finite Element Analysis 2017-18						
Applied Thermo-fluids Systems 2017-18						
Combustion and Sustainable Fuels 2017-18						
Engineering Research Project 2017-18						
Industrial Turbo-machinery 2017-18						
Intelligent Systems and Control 2017-18						40
Machines in Power Generation 2017-18						
Project Management 2020-21						50
Sensors, Actuators and Controllers 2017-18						
Sustainable Energy Systems 2020-21						
Vibration and Acoustic Analysis of Systems 2017-18						75

Appendix III - Benchmark Analysis

This table maps programme learning outcomes to relevant QAA subject benchmark statements or PSRB guidelines.

Knowledge and Understanding

	Engin01	Engin02	Engin03	Engin04	Engin05	Engin06	Engin07	Engin08	Engin09
PO1									
PO2									
PO3									
PO4							✓		

	Engin10	Engin11	Engin12	Engin13	Engin14	Engin15	Engin16	Engin17	Engin18
PO1									
PO2							✓	✓	✓
PO3									
PO4									

	Engin19	Engin20	Engin21	Engin22	Engin23	Engin24	Engin25	Engin26	MEng01
PO1									
PO2									
PO3				✓					
PO4			✓			✓			

	MEng02	MEng03	MEng04	MEng05	MEng06	MEng07	MEng08	MEng09	MEng10
PO1									✓
PO2									
PO3								✓	
PO4									

	MEng11	MEng12	MEng13	MEng14	MEng15	MEng16	MEng17	MEng18	MEng19
PO1									

PO2							✓		
PO3						✓			
PO4									

	MEng20	MEng21	MEng22	MEng23	MEng24	MEng25	MEng26	MEng27	MEng28
PO1									
PO2									
PO3									
PO4									

	MEng29	MEng30	MEng31	MEng32	MEng33	MEng34
PO1						
PO2						
PO3	✓					
PO4						

Subject Specific Intellectual Skills

	Engin01	Engin02	Engin03	Engin04	Engin05	Engin06	Engin07	Engin08	Engin09
PO5									
PO6									
PO7									
PO8				✓					

	Engin10	Engin11	Engin12	Engin13	Engin14	Engin15	Engin16	Engin17	Engin18
PO5									
PO6									
PO7		✓							
PO8									

	Engin19	Engin20	Engin21	Engin22	Engin23	Engin24	Engin25	Engin26	MEng01

PO5									
PO6									
PO7									
PO8								✓	

	MEng02	MEng03	MEng04	MEng05	MEng06	MEng07	MEng08	MEng09	MEng10
PO5									
PO6									
PO7									
PO8									

	MEng11	MEng12	MEng13	MEng14	MEng15	MEng16	MEng17	MEng18	MEng19
PO5									
PO6					✓	✓			✓
PO7									
PO8							✓		

	MEng20	MEng21	MEng22	MEng23	MEng24	MEng25	MEng26	MEng27	MEng28
PO5	✓								
PO6									
PO7				✓					
PO8	✓						✓		

	MEng29	MEng30	MEng31	MEng32	MEng33	MEng34
PO5						
PO6						
PO7						
PO8				✓		

Subject Specific Practical Skills

	Engin01	Engin02	Engin03	Engin04	Engin05	Engin06	Engin07	Engin08	Engin09
PO9							✓		
PO10									
PO11									
PO12					✓	✓			

	Engin10	Engin11	Engin12	Engin13	Engin14	Engin15	Engin16	Engin17	Engin18
PO9									
PO10									
PO11									
PO12									

	Engin19	Engin20	Engin21	Engin22	Engin23	Engin24	Engin25	Engin26	MEng01
PO9									
PO10			✓						
PO11	✓			✓					
PO12									

	MEng02	MEng03	MEng04	MEng05	MEng06	MEng07	MEng08	MEng09	MEng10
PO9									
PO10									
PO11									
PO12									

	MEng11	MEng12	MEng13	MEng14	MEng15	MEng16	MEng17	MEng18	MEng19
PO9									
PO10			✓		✓				
PO11									
PO12								✓	

	MEng20	MEng21	MEng22	MEng23	MEng24	MEng25	MEng26	MEng27	MEng28
PO9									
PO10									

PO11									
PO12		✓							

	MEng29	MEng30	MEng31	MEng32	MEng33	MEng34
PO9						
PO10						
PO11						
PO12						

Transferable Skills and Attributes

	Engin01	Engin02	Engin03	Engin04	Engin05	Engin06	Engin07	Engin08	Engin09
PO13									
PO14							✓		
PO15							✓		
PO16									
PO17									

	Engin10	Engin11	Engin12	Engin13	Engin14	Engin15	Engin16	Engin17	Engin18
PO13				✓					
PO14									
PO15									
PO16									
PO17					✓	✓			

	Engin19	Engin20	Engin21	Engin22	Engin23	Engin24	Engin25	Engin26	MEng01
PO13									
PO14									
PO15									
PO16									
PO17									

	MEng02	MEng03	MEng04	MEng05	MEng06	MEng07	MEng08	MEng09	MEng10
PO13									
PO14									
PO15									
PO16									
PO17									

	MEng11	MEng12	MEng13	MEng14	MEng15	MEng16	MEng17	MEng18	MEng19
PO13									
PO14						✓			
PO15									
PO16									
PO17									

	MEng20	MEng21	MEng22	MEng23	MEng24	MEng25	MEng26	MEng27	MEng28
PO13				✓			✓		
PO14									
PO15	✓								
PO16									
PO17									

	MEng29	MEng30	MEng31	MEng32	MEng33	MEng34
PO13					✓	
PO14						
PO15						
PO16						✓
PO17	✓			✓	✓	✓

Appendix IV:
Benchmark Benchmark Statement(s)

Engin01 - *Knowledge and understanding of scientific principles and methodology necessary to underpin their education in mechanical and related engineering disciplines, to enable appreciation of its scientific and engineering context and to support their...*

Engin02 - *Knowledge and understanding of mathematical principles necessary to underpin their education in mechanical and related engineering disciplines and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and...*

Engin03 - *Ability to apply and integrate knowledge and understanding of other engineering disciplines to support the study of mechanical and related engineering disciplines.*

Engin04 - *Understanding of engineering principles and the ability to apply them to analyse key engineering processes.*

Engin05 - *Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.*

Engin06 - *Ability to apply quantitative methods and computer software relevant to mechanical and related engineering disciplines, to solve engineering problems.*

Engin07 - *Understanding of and ability to apply a systems approach to engineering problems.*

Engin08 - *Investigate and define a problem and identify constrains including environmental and sustainability limitations, health and safety and risk assessment issues.*

Engin09 - *Understand customer and user needs and the importance of considerations such as aesthetics.*

Engin10 - *Identify and manage cost drivers.*

Engin11 - *Use creativity to establish innovative solutions.*

Engin12 - *Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal.*

Engin13 - *Manage the design process and evaluate outcomes.*

Engin14 - *Knowledge and understanding of commercial and economic context of engineering processes.*

Engin15 - *Knowledge of management techniques which may be used to achieve engineering objectives within that context.*

Engin16 - *Understanding of the requirement for engineering activities to promote sustainable development.*

Engin17 - *Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues.*

Engin18 - *Understanding of the need for a high level of professional and ethical conduct in engineering.*

Engin19 - *Knowledge of characteristics of particular equipment, processes or products.*

Engin20 - *Engineering workshop and laboratory skills.*

Engin21 - *Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc)*

Engin22 - *Understanding use of technical literature and other information sources.*

Engin23 - *Awareness of nature of intellectual property and contractual issues.*

Engin24 - *Understanding of appropriate codes of practice and industry standards.*

Engin25 - *Awareness of quality issues.*

Engin26 - *Ability to work with technical uncertainty.*

MEng01 - *A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice.*

MEng02 - *A comprehensive understanding of techniques applicable to their own research or advanced scholarship.*

MEng03 - *Originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline.*

MEng04 - *Conceptual understanding that enables the student. To evaluate critically current research and advanced scholarship in the disciplineAnd. To evaluate methodologies and develop critiques of them and, where appropriate, to propose new hypotheses*

MEng05 - *Able to deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences.*

MEng06 - *Demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level.*

MEng07 - *Continue to advance their knowledge and understanding, and to develop new skills to a high level.*

MEng08 - *The qualities and transferable skills necessary for employment requiring. The exercise of initiative and personal responsibility. Decision-making in complex and unpredictable situations ...*

MEng09 - *Have a comprehensive knowledge and understanding of mathematical models relevant to*

the engineering discipline, and an appreciation of their limitations.

MEng10 - *Have a comprehensive understanding of the scientific principles of own specialisation and related disciplines.*

MEng11 - *Have a comprehensive knowledge and understanding of the role and limitations of ITC, and an awareness of developing technologies in ITC.*

MEng12 - *Have a wide knowledge and comprehensive understanding of the design process and the ability to apply and adapt the techniques in unfamiliar situations.*

MEng13 - *Have extensive knowledge and understanding of a wide range of engineering materials and components.*

MEng14 - *Have extensive knowledge and understanding of management and business practices, and their limitations, and can apply appropriately.*

MEng15 - *Have a thorough understanding of current practice and its limitations, and some appreciation of likely new developments.*

MEng16 - *Have an understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in technical and business decisions.*

MEng17 - *Have a comprehensive understanding of design methodologies related to their discipline and the ability to apply and adapt them in unfamiliar situations.*

MEng18 - *Have an understanding of the capabilities of computer based models for solving problems in engineering, and the ability to assess the limitations of particular cases.*

MEng19 - *Have the ability to make general evaluations of commercial risks through some understanding of the basis of such risks.*

MEng20 - *Able to use fundamental knowledge to investigate new and emerging technologies.*

MEng21 - *Able to extract, from given data, that which is pertinent to an unfamiliar problem, and apply in its solution, using computer based engineering tools when appropriate.*

MEng22 - *Able to select appropriate data from a range of possible data sets and present them in alternative forms to create deeper understanding and/or greater impact.*

MEng23 - *Able to generate an innovative design for systems, components or processes to fulfil new needs.*

MEng24 - *Able to integrate presentational techniques and the information to be presented for maximum impact.*

MEng25 - *Able to integrate knowledge of mathematics, science, information technology, design, business context and engineering practice to solve a substantial range of engineering problems, some of a complex nature, apply understanding to novel and...*

MEng26 - *Able to apply engineering techniques taking account of a range of commercial and industrial constraints.*

MEng27 - *Able to research and use new methods required for novel situations and adapt to specific purposes if necessary.*

MEng28 - *Able to recognise the capabilities and limitations of computer based methods for engineering problem solving, have some awareness of the future developments of IT tools, and formulate and anticipate needs.*

MEng29 - *Able to learn new theories, concepts, methods etc in an unfamiliar situation outside the discipline area.*

MEng30 - *Able to be innovative in the use of a broad range of scientific principles in solving engineering problems.*

MEng31 - *Able to generate ideas for new products and develop and evaluate a range of new solutions.*

MEng32 - *Able to develop, monitor and update a plan, to reflect a changing operating environment.*

MEng33 - *Able to monitor and adjust a personal programme of work on an on-going basis and can learn independently.*

MEng34 - *Able to undertake most of the technical roles within a team and can exercise leadership.*