



Programme Specification

A statement of the knowledge, understanding and skills that underpin a taught programme of study leading to an award from
The University of Sheffield

1	Programme Title	Advanced Mechanical Engineering
2	Programme Code	MECT53
3	JACS Code	H300
4	Level of Study	Postgraduate
5	Final Qualification	MSc
6	Intermediate Qualification(s)	Postgraduate Diploma, Postgraduate Certificate
7	Teaching Institution (if not Sheffield)	Not applicable
8	Faculty	Engineering
9	Home Department	Mechanical Engineering
10	Other Department(s) involved in teaching the programme	Core modules: English Language Teaching Centre Optional modules: Materials Science and Engineering
11	Mode(s) of Attendance	Full-time
12	Duration of the Programme	1 year
13	Accrediting Professional or Statutory Body	Institution of Mechanical Engineers
14	Date of production/revision	February 2024

15. Background to the programme and subject area

Professional mechanical engineers are concerned with creating economic and social value through the design, development, production and maintenance of all kinds of artefacts that improve and support economies and societies. They are creative and logical people who synthesize information, solve problems and innovate. A career in mechanical engineering can involve graduates in any stage of the conception, design, production, finance and marketing of all manufactured goods. Research-trained mechanical engineers can go on to work in small to medium-sized companies, or a larger employer such as BAE Systems, Rolls Royce Plc, Jaguar or ICI. They can also work independently, begin their own business, work in a large number of disciplines where innovation and numeracy are required, or become established in research.

The MSc programme in Advanced Mechanical Engineering gives new graduates and professional mechanical engineers a unique opportunity to enhance their knowledge and skills in Advanced Mechanical Engineering and will enable graduates to develop solutions to challenges facing industry and society.

The programme offers a combination of modules on engineering and professional skills, a range of modules in advanced mechanical engineering, an understanding of contemporary challenges in the sector, and a research project relevant to the degree title. They have been developed specifically to meet the need of industry for high quality post-graduates with enhanced knowledge in specific areas of mechanical engineering, including training in research methods and management. Students are taught in a research led-environment and the programme reflects the research strengths and industrial experience of staff.

This MSc Programme in Advanced Mechanical Engineering fully satisfies the academic requirements for further learning associated with the award of Chartered Engineer Status and is accredited by the Institution of Mechanical Engineers. Students successfully completing the programme will be well-suited to a career in a wide range of areas, both within mechanical engineering and more generally, and to meet the challenges of working within an ever-changing discipline and world.

Further information about the programme may be found at <http://www.shef.ac.uk/mecheng/>

16. Programme aims

The University's Mission is to provide students from a wide variety of educational, social and cultural backgrounds with high quality education in a research-led environment drawing on staff working at the frontiers of academic enquiry. The Department of Mechanical Engineering implements this through its strong commitment to both teaching and research. It also aims to engender in its students a commitment to future self-learning and social responsibility.

The programmes aim to:

- encourage, expect and equip students in developing an advanced knowledge base grounded in a firm understanding of the context in which contemporary engineering takes place.
- support students as self-motivated, adaptable learners who can draw on engineering science, practical and 'how-to' skills to identify and solve the diversity of challenges present in modern engineering and technology on a global stage.
- provide teaching that is informed and invigorated by the research and scholarship of its staff and alert to the benefits of student-centred learning.
- develop in students an independence of thought, intellectual curiosity and critical approach to evidence, theories and concepts.
- enable students to maximise their potential in all aspects of their course, understanding their strengths and weaknesses and beginning their journey of Continuous Professional Development.
- provide advanced understanding and critical knowledge in selected areas of mechanical engineering appropriate to the programme, including knowledge of contemporary issues facing the industry.
- provide experience in a research investigation appropriate to the programme.
- provide opportunities for students to become skilled in technical tools and practical techniques appropriate to their career direction and interests, and the professional skills needed for working effectively in a professional engineering environment.
- prepare students for postgraduate work, further postgraduate study and/or a research career in mechanical engineering.

17. Programme learning outcomes

Knowledge and understanding: By graduation MSc students will have:

K1	advanced knowledge and understanding of the concepts, theories and principles in areas of mechanical engineering appropriate to the programme.
K2	an understanding of how advanced analytical methods are used in mechanical engineering appropriate to the programme.
K3	critical knowledge of problems at the forefront of the specialism and an awareness of emerging technologies.
K4	a broad understanding of approaches to research in mechanical engineering.
K5	a broad understanding of the commercial and social context within which research is undertaken, including an awareness of the ethical implications of engineering.

Skills and other attributes: By graduation MSc students will be able to:

S1	demonstrate skills in the acquisition, use and critical evaluation of subject-related information.
S2	conduct a research investigation, taking account of technical, environmental, ethical, and commercial considerations.
S3	use engineering science, mathematics and information technology to analyse and solve engineering problems.
S4	deploy creativity, innovation and design techniques in solving unfamiliar problems and fulfilling new needs.
S5	deploy production tools to safely realise an idea into a product.
S6	communicate at a professional level, orally and in writing.
S7	work effectively in collaboration with others.
S8	exercise independent thought and judgement.
S9	describe their own strengths and weaknesses and use this to engage with their own development.

S10	use simple project and workload management tools to develop a systematic approach to structuring and tracking work and manage successful completion.
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NB: Diploma students will have developed the learning outcomes associated with the acquisition of 120 credits selected in accordance with the programme regulations. Certificate students will have developed the learning outcomes associated with the acquisition of 60 credits selected in accordance with the programme regulations. An award of Diploma or Certificate shall therefore exclude the project.

18. Teaching, learning and assessment

Development of the learning outcomes is promoted through the following teaching and learning methods:

The following are the main teaching and learning methods used:

Lectures - the principal means of transmitting academic material and analysis techniques. Most lecture courses provide tutorial sheets to enable students to develop their understanding of the subject matter and methods during their private study.

Coursework Assignments, Oral and Poster Presentations - a number of modules have coursework assignments that require students to seek additional information and work on their own, or sometimes in small groups. They are designed to enable students to develop and show their understanding of the content of the module. Oral and poster presentations are often included as part of coursework assignments to provide opportunities for developing these essential skills.

Individual Research Project - This is a research project at the frontiers of mechanical engineering. It is conducted under the supervision of a member of the academic staff and provides an excellent opportunity for the students to pull together every aspect of their development during the programme.

The following are the main assessment methods used:

Written Examinations - these are typically 2-3 hours in duration. Some modules use this as the only or major assessment method.

Coursework Assignments and Oral Presentations - coursework assignments are used in a number of modules to assess the understanding of the module. Assignments are mainly undertaken on an individual basis but are sometimes carried out in small groups. Some assignments use oral presentations in order to assess the development of presentation and communication skills. Some modules use coursework assignments as the only or main method of assessment whilst others have this as a minor part with a written examination forming the major part of the overall assessment.

Individual Research Project - The project is assessed on the student's commitment and progress throughout the project. An interim oral presentation is organised in the second semester. A written report, an oral presentation to a panel of academic staff and the response to questions from the panel form the main assessment of the project at the end of the summer period. The project is expected to be at a professional level.

Portfolio - professional skills and personal development are supported, developed, recorded and assessed through a portfolio which combines mandatory elements and personalised evidence.

The main teaching, learning and assessment methods adopted for each learning outcome are shown below. In most cases a combination of methods is used.

LEARNING OUTCOME (abbreviated - see Section 17 for full text)	TEACHING/LEARNING			ASSESSMENT			
	Lectures	Coursework assignments, oral and poster presentations	Individual research project	Portfolio	Written examinations	Coursework assignments, oral and poster presentations	Individual research project
K1 Advanced understanding
K2 Analytical methods	.				.		
K3 Critical knowledge	
K4 Research approaches

K5 Context of research
S1 Acquisition / evaluation of data			.				
S2 Conduct research investigation			.				
S3 Use engineering science							
S4 Creativity, innovation and design			.				
S5 Production skills							
S6 Communicate effectively							
S7 Collaborate in teams							
S8 Independent thought							
S9 Personal development				Y			
S10 Project management			ψ			ψ	ψ

The overall proportions of assessment by the various methods are given in the following table:
(Note: A range is given due to some optional modules being assessed by different methods)

Proportions of total assessment (%)	
Written examinations	15% to 34%
Coursework submissions	25% to 44%
Individual project	33%
Portfolio	8%

19. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements

<https://www.qaa.ac.uk/quality-code/subject-benchmark-statements>

Framework for Higher Education Qualifications (2014)

<https://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf>

University Vision and Strategic Plan

<https://www.sheffield.ac.uk/vision>

20. Programme structure and regulations

The programme structure is modular and runs full-time for 12 months; two academic semesters run from October to June with a summer period running from June to September. Students must obtain a total of 180 credits.

There is a core syllabus of 60 credits over both semesters aimed at developing a broad understanding of the social and commercial context within which research is undertaken and also developing their general and transferable skills. In the first semester students undertake a 5 credit report writing module taught by the ELTC. This is classroom-based and the students learn how to structure and write engineering reports effectively. A 15 credit management and business practice module and a 15 credit module comparing experimental and modelling techniques and their application to fluids, solid and dynamics. A further 15 credit professional development portfolio module is undertaken over both semesters where students tailor the module to their own skill development, this includes units for improving IT skills, career readiness and personal management skills as well as the professional responsibility of an engineer considering the ethical, social, legal and environmental issues that are essential for a professional engineer in the modern world.

Students also choose four 15 credit modules from a selection of about 18 advanced modules in areas of mechanical engineering. These advanced optional modules enable them to follow their areas of particular interest and help prepare them for the initial stages of their career. All optional modules are at Masters' Level (F7 level as defined in the framework for Higher Education Qualifications). Advice from staff on the choice of modules is available.

MSc students undertake a group research project of 10 credits in the first semester and will start their background reading and planning for their individual research project with 5 credits over the second semester. The remaining 55

credits are undertaken in the summer. The individual research project is undertaken under the supervision of an academic member of staff and is related to established research work and/or industrial problems. It provides the student with an excellent opportunity to consolidate the skills and knowledge learnt on the programme during a major piece of individual work.

Students who do not achieve the requirements for the Master programme will be awarded a Postgraduate Diploma provided they achieve at least 120 credits from units which shall exclude the project.

Students who do not achieve the requirements for the Postgraduate Diploma will be awarded a Postgraduate Certificate provided they achieve at least 60 credits from units which shall exclude the project.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual modules are published in the University Calendar available on-line at <https://www.sheffield.ac.uk/calendar/>

21. Progression through the programme structure

Semester 1 – In the core subjects, students will gain a broad understanding of the social and commercial context within which research is undertaken. They will also develop their independent learning, communication and IT skills. The taught modules each student chooses will be in areas appropriate to the programme and which reflect their interests and initial career choice. These modules are at Masters' level and are at the leading edge of the subject. Students will choose their personal investigative project, begin planning and conduct an initial literature survey.

Semester 2 - Students will have a more extensive knowledge and understanding of the main areas of mechanical engineering appropriate to the programme. They will be applying their knowledge and skills to more advanced problems and activities. They will continue to develop their independent learning, communication skills and their ability to work individually and in teams. They will have completed about a third of their investigative project and this will be assessed in a poster and oral presentation.

Summer Period - By this stage, students are expected to have become self-motivated, efficient and organised independent learners. The summer period is entirely devoted to completing the individual research project where students can demonstrate the full range of personal, communication and academic skills met within the programme. It is assessed at the end of the summer period through a report, an oral presentation and a viva to a panel of staff with other students also present. This assessment enables the student to demonstrate the overall professional level achieved at the end of the programme.

On successful completion of the programme They will have acquired a capacity to understand and to manage the process of innovative research and have acquired a range of subject-specific and generic skills appropriate to employment both within and outside mechanical engineering. They will be well placed to assume positions of responsibility within industry, and will be able to make an immediate, effective contribution for their employers. Alternatively, graduates wishing to pursue further research will have received thorough research training and will be able to proceed more effectively to a PhD or other postgraduate research work. They will have obtained the necessary academic qualification and practical skills for becoming a Chartered Mechanical Engineer. Full Chartered Engineer status may require some further acquisition of knowledge and skills and will require appropriate experience following completion of the Programme.

22. Criteria for admission to the programme

The programme is suitable for well-qualified and motivated students. The admissions procedure is aimed at ensuring students taken onto the course meet the requirements for successful completion regardless of the applicant's educational or other background.

Typically, applicants are expected to have at least a 2.1 degree or equivalent in mechanical engineering or related area. Applicants with other qualifications or appropriate professional experience will also be considered.

All applicants require an English language qualification, typically a GCSE or an IELTS test.

Detailed information regarding admission to the programme is available at <http://www.shef.ac.uk/study/>

23. Additional information

Every student has a Personal Tutor who is a member of the academic staff of the department. All tutors are also involved in research and take part in the administration of the course. Students first meet their personal tutor when they arrive for registration in the department. The personal tutor is available to provide general help and advice on all aspects of university life and play a key role in helping the student find a suitable research project and supervisor. Students are in regular contact with their tutor in the first semester when they seek guidance on the choice of their optional modules and research project. In following semesters in addition to the personal tutor, the research project supervisor can also provide general help and advice. The personal tutor and project supervisor will monitor the student's progress throughout the year and will be able to help in providing references and advice on career decisions.

Academic staff in the Department of Mechanical Engineering are organised into research themes that reflect their specific areas of research activity. Within each theme are a number of research clusters, where staff work in small groups with colleagues from both within the department and across the University. Each theme contains staff whose interests encompass both fundamentals and applications. At the applied level groups co-operate with industry. Expertise in the different groups covers the need for the different programmes. Students are taught in a research-led environment and the programmes reflect the research strengths of staff. Current research activities can be summarised in five main themes:

- Biomechanics
- Dynamics
- Manufacturing & Design
- Solid Mechanics
- Thermofluids

Further details about the department, research profiles, courses' offered and admission procedures can be found at the departmental Web site <http://www.sheffield.ac.uk/mecheng>.

This specification represents a concise statement about the main features of the programme and should be considered alongside other sources of information provided by the teaching department(s) and the University. In addition to programme specific information, further information about studying at The University of Sheffield can be accessed via our Student Services web site at www.shef.ac.uk/ssid.