



The  
University  
Of  
Sheffield.

## 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

### Programme Details

1. Programme title	Mechanical Engineering
2. Programme code	MECU002
3. QAA FHEQ level	FHEQ Level 6 - Honours
4. Faculty	Engineering
5. Department	Mechanical Engineering
6. Other departments providing credit bearing modules for the programme	Core modules: <ul style="list-style-type: none"><li>• Faculty of Engineering (FCE)</li><li>• Mathematics and Statistics (MAS)</li><li>• Electronic &amp; Electrical Engineering (EEE)</li><li>• Management School (MGT)</li></ul> Optional Modules: <ul style="list-style-type: none"><li>• Automatic Control &amp; Systems Engineering (ACS)</li><li>• Mathematics &amp; Statistics (MAS)</li></ul>
7. Accrediting Professional or Statutory Body	Institution of Mechanical Engineers
8. Date of production/revision	October 2020, September 2022, September 2023, September 2024

Awards	Type of award	Duration
9. Final award	Bachelor of Engineering (BEng)	3 years
10. Intermediate awards		

## Programme Codes

11. JACS code(s) <i>Select between one and three codes from the <a href="#">HESA website</a>.</i>	H300		
12. HECoS code(s) <i>Select between one and three codes from the <a href="#">HECoS vocabulary</a>.</i>	100190		

## Programme Delivery

13. Mode of study	Full-time
14. Mode of delivery	Face to face

## 15. Background to the programme and subject area

Professional mechanical engineers are concerned with the design, development, production and marketing of all kinds of artefacts that improve and support our way of life. They are creative people and 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 - from the largest power station, aeroplane, space craft and car plant to delicate mechanisms required for scientific instruments, heart valves or micro-surgery. Graduate mechanical engineers can end up working for a small to medium sized company, or a larger employer such as BAE Systems, Rolls Royce Plc, Jaguar Landrover or ICI. They can also work independently, begin their own business, or work in a variety of employment where innovation and numeracy are required, or become established in research.

At Sheffield we aim to provide the academic qualifications and practical engineering applications experience for students wishing to enter the mechanical engineering profession, without specialising in any particular aspect of mechanical engineering in their first degree. The BEng degree in Mechanical Engineering contributes towards the academic and practical requirements for the award of Chartered Engineer Status and is fully accredited by the Institution of Mechanical Engineers IMechE at the BEng(Hons) level of the Engineering Council UK Spec (UK Standards for Professional Engineering Competence). Full Chartered Engineer status will require the completion of an appropriate matching section and experience following graduation. The programme will equip graduates to enter and succeed in a wide range of careers, both within mechanical engineering and more generally, and to meet the challenges of working within an ever-changing discipline.

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

## 16. Programme aims

BEng Mechanical Engineering aims to:	
<b>A1</b>	provide graduating students with a high-quality accredited qualification that meets the academic requirements for future Chartered Engineer status, as required by the Engineering Council via the IMechE.
<b>A2</b>	deliver a coherent curriculum founded on critical thinking, capable engineering analysis, confident problem-solving and personal development.
<b>A3</b>	provide a broad knowledge and understanding of mechanical engineering, including the commercial and social context.

<b>A4</b>	develop in students an independence of thought, intellectual curiosity and critical approach to evidence, theories and concepts.
<b>A5</b>	provide an inclusive learning environment enabling every student to maximise their potential in all aspects of their programme.
<b>A6</b>	foster safe and competent laboratory, manufacturing and assembly practice.
<b>A7</b>	nurture in students their powers of creativity and innovation.
<b>A8</b>	prepare students for professional practice by building in them an awareness of what mechanical engineers do, what their professional and legal responsibilities are, how they can understand and navigate ethical dilemmas, and supporting them to achieve competence in managing their own Continuing Professional Development (CPD).

## 17. Programme learning outcomes

<b>Knowledge and understanding</b>		
On successful completion of the programme, students will be able to demonstrate knowledge and understanding of:		
		<b>Links to Aim(s)</b>
<b>K1</b>	scientific principles and methodology necessary to underpin an education in mechanical engineering.	A1, A3
<b>K2</b>	the materials, components and production methods available to mechanical engineers.	A1, A3
<b>K3</b>	mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations in the analysis and solution of engineering problems.	A1, A3
<b>K4</b>	the context in which engineering is conducted and be able to translate this into opportunities and constraints.	A1, A3, A7, A8
<b>K5</b>	the importance of engineers and engineering in making a positive and professional contribution to the world, with consideration of equality, diversity, and inclusion.	A1, A3, A5, A7, A8
<b>Intellectual capabilities</b>		
On successful completion of the programme, students will be able to:		
<b>I1</b>	use knowledge and understanding (above) from own engineering disciplines to conduct engineering analysis, deploying software tools as appropriate.	A1, A2, A4
<b>I2</b>	integrate knowledge, understanding, skills, attitude and engineering analysis to solve engineering problems holistically and systematically.	A1, A2, A4, A8
<b>I3</b>	make engineering judgements and manage risk using appropriate approaches, including security risk and amongst incomplete and ambiguous data.	A1, A2, A4, A8

<b>I4</b>	apply structured design processes and tools and understand their limitations.	A1, A2, A4, A7
<b>I5</b>	use research skills to leverage fundamental knowledge through critical, independent thought to investigate and solve problems, validate proposed solutions, and/or create commercial and societal value.	A1, A2, A4, A7
<b>Practical engineering skills</b>		
On successful completion of the programme, students will be able to:		
<b>P1</b>	describe and apply the principles of experimental method to design and project manage the delivery of an experiment (including managing resources).	A1, A6
<b>P2</b>	select and use experimental equipment relevant to mechanical engineering with an understanding of their advantages, drawbacks and appropriate use.	A1, A6
<b>P3</b>	select the correct production tool for a job, understanding its advantages and limitations (including manufacturing constraints), and deploy it safely to realise an idea into a product.	A1, A6
<b>P4</b>	recognise where health and safety risk occurs in practical activities and perform a risk assessment and conducting themselves in a safe way.	A1, A6, A8
<b>P5</b>	professionally and clearly record methods, observations and data during an experiment.	A1, A6
<b>Professional capabilities</b>		
On successful completion of the programme, students will be able to:		
<b>PC1</b>	identify effective channels and communicate with technical and non-technical audiences, as a member of a team and individually.	A1, A5, A8
<b>PC2</b>	collaborate effectively and build and work in teams to deliver work and share skills and expertise.	A1, A5, A8
<b>PC3</b>	demonstrate individual effectiveness and self-awareness, articulating and evidencing their strengths and weaknesses, demonstrating self-motivation and commitment to their own development, and operate as an enquiring, engaged learner and professional.	A1, A5, A8
<b>PC4</b>	confidently locate, manage and utilise information, navigating and using both formal and informal sources, including technical and academic literature.	A1, A5, A8
<b>PC5</b>	be enterprising by recognising and seizing opportunities to turn ideas into action to make a positive difference, through planning and managing a programme of work.	A1, A5, A7, A8

## 18. Learning and teaching methods

**The following are the main learning and teaching methods implemented within the programme:**

**Lectures:** These are principal means of transmitting academic material and analysis techniques. Most lecture courses provide tutorial sheets to enable students to develop their understanding during private study.

**Tutorials (and Example Classes):** These support students to resolve problems in their understanding of course material with students in appropriate group sizes (from small-groups to full-

class).

**Practical Activities:** These typically take the form of laboratory or workshop classes. Laboratory classes introduce experimental methods and provide an opportunity for students to observe phenomena taught elsewhere in the curriculum, supporting their understanding. They also provide a good opportunity to develop collaboration and communication skills. Workshop classes provide students with an opportunity to apply a broad range of manufacturing processes to fabricate much valued and rewarding artefacts. In-curriculum links with the University's student-led Makerspace (iForge) allow students to take responsibility for their practical work these positive experiences promote further, optional in- or extra-curriculum learning.

**Online Resources:** These resources can be the primary method of delivery, or as a 'capture' that offers students the opportunity to revisit topics. They might be dedicated resources developed by academic staff and made available to students through the Virtual Learning Environment (VLE) or a set of carefully curated pre-existing resources (e.g. from the wide range of online expert learning providers that are publicly available or part of the University's subscriptions) that the students are signposted towards. This format builds digital literacy, supports self-paced learning and helps facilitate a more diverse, and therefore inclusive, learning environment.

**Design Classes:** These classes support students to integrate and develop their knowledge and understanding, intellectual capabilities and practical skills in order to address typical engineering problems that are "open-ended" and often ill-defined. They also provide good opportunities for developing professional capabilities such as collaboration, communication and project management.

**Coursework Assignments (including Oral, Video 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, video or and poster presentations are often included as part of coursework assignments to provide opportunities for developing essential communication skills.

**Investigative Project:** This is the largest individual project on the programme and is undertaken in year 3 under the supervision of an academic member of staff. It is an individual research and/or industrial project of mechanical engineering and provides students with an excellent opportunity to synthesise every aspect of their development during the programme.

**Professional Workshops:** This is undertaken in Year 3 but builds upon the professional development training that is embedded throughout the programme, starting in year 1. It provides students with space and support to reflect on and synthesise their learning, interrogate their own values and career goals and identify and implement development opportunities to help achieve these goals. It reinforces the importance of Continuing Professional Development, which is integral to professional practice, and supports students in the transition represented by graduation.

**Integrative Projects:** These are substantial, carefully designed learning experiences that provide a context in which a wide range of programme learning outcomes ('K', 'I', 'P' and 'PC') can be realised and integrated. These projects typically consist of multiple phases that require students to work individually and in groups on a broad range of learning and teaching activities such as those outlined above.

The learning and teaching methods (above) are mapped against the learning outcomes (from section 17) in the table below:

Learning Outcome		Learning & Teaching Method (see above)								
		Lectures	Tutorials	Practical Activities	Online Resources	Design Classes	Coursework Assignments	Investigative Project	Professional Workshops	Integrative Projects
K1	Scientific principles & methods	✓	✓	✓	✓	✓	✓	✓		✓
K2	Materials, components and production methods	✓	✓	✓	✓			(✓)		✓
K3	Mathematical & statistical methods	✓	✓		✓		✓	✓		✓
K4	Context of engineering	✓	✓		✓		✓	(✓)	(✓)	✓
K5	Positive & professional contribution	✓	✓			✓	✓	(✓)	(✓)	✓
I1	Conduct engineering analysis	✓	✓	✓		✓	✓	✓		✓
I2	Solve engineering problems	✓	✓	✓		✓	✓	✓		✓
I3	Manage risk	✓				✓	✓	(✓)	(✓)	✓
I4	Apply structured design processes					✓		✓		✓
I5	Use research skills					✓	✓	✓	(✓)	✓
P1	Design and conduct an experiment			✓				(✓)		✓
P2	Use experimental equipment	✓				✓	✓	(✓)		✓
P3	Realise an idea into a product	✓		✓		✓	✓	(✓)	(✓)	✓
P4	Manage risks to health and safety	✓		✓		✓	✓	(✓)	(✓)	✓
P5	Record pertinent information	✓	✓	✓			✓	✓	(✓)	✓
PC1	Communicate proficiently	✓		✓			✓	✓	(✓)	✓
PC2	Collaborate effectively	✓	✓			✓	✓	✓	(✓)	✓
PC3	Be effective and self-aware		✓	✓		✓		(✓)	✓	✓
PC4	Information literacy	✓	✓	✓				✓	(✓)	✓
PC5	Be enterprising						✓	✓	(✓)	✓

## 19. Assessment and feedback methods

The following are the main assessment methods implemented within the programme:

**Written Examinations:** Exams are typically 1.5 - 3 hours in duration, depending on module size and the presence of complementary assessment methods. Some modules use examinations as the only assessment method.

**Coursework Assignments (including Oral, Video and Poster Presentations):** Coursework assignments are widely used in design studies, computational work, laboratory reports, essays or other work designed 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, video and/or poster presentations to assess the development of presentation and communication skills. Some modules use coursework assignments as the only method of assessment whilst others have complementary assessments such as a written examination.

**Class Test:** These are small tests conducted during the main teaching periods to assess progress and understanding. They provide the module leader with a general overview of student progress and allowing individual students to gauge their own progress.

**Investigative Project:** This is the largest individual project on the programme and is undertaken in year 3. It is assessed on the student's commitment and progress throughout the project, a written thesis, and a viva voce to a panel of academic staff and the response to questions from the panel. All assignments are expected to be completed to a professional standard.

**Integrative Projects:** These are substantial, carefully designed learning experiences that provide a context in which a wide range of programme learning outcomes ('K', 'I', 'P' and 'PC') are assessed. These projects typically consist of multiple phases and are continually assessed with students producing a variety of group and individual assessment elements.

The assessment and methods (above) are mapped against the learning outcomes (from section 17) in the table below:

Learning Outcome		Assessment and Feedback Method (see above)				
		Exam	CA	Class Test	Investigative Project	Integrative Project
K1	Scientific principles & methods	✓	✓	✓	✓	
K2	Materials, components and production methods	✓	✓	✓	(✓)	✓
K3	Mathematical & statistical methods	✓	✓		(✓)	✓
K4	Context of engineering	✓	✓		✓	✓
K5	Positive & professional contribution	✓	✓		✓	✓
I1	Conduct engineering analysis	✓	✓	✓	✓	✓
I2	Solve engineering problems		✓		✓	✓

I3	Manage risk		✓		✓	✓
I4	Apply structured design processes		✓		(✓)	✓
I5	Use research skills		✓		✓	✓
P1	Design and conduct an experiment		✓		(✓)	✓
P2	Use experimental equipment		✓		(✓)	✓
P3	Realise an idea into a product		✓		(✓)	✓
P4	Manage risks to health and safety		✓	✓	(✓)	✓
P5	Record pertinent information		✓		(✓)	✓
PC1	Communicate proficiently		✓		✓	✓
PC2	Collaborate effectively		✓			✓
PC3	Be effective and self-aware		✓			✓
PC4	Information literacy		✓		✓	✓
PC5	Be enterprising		✓		✓	✓

Feedback to students will be given on a regular basis throughout the Programme. It will provide encouragement and will offer suggestions for improvement. Students will be expected to use feedback from staff to improve the quality of their work and enhance their personal development. The feedback can be summative (e.g. written comments on assignments) or formative (e.g. verbally during lectures, tutorials, laboratory, and other teaching and learning sessions).

Feedback from students and the industry sponsors/employers is actively sought in order to monitor the operational delivery of the programme against its educational aims and objectives, as well as industry requirements, and thus assist staff to strive for continuous improvement.

## 20. Programme structure and student development

The programme structure is modular and in each year students study modules worth a total of 120 credits. During the first 2½ years students follow a core syllabus aimed at developing the essential skills and knowledge in the fundamentals of mechanical engineering, mathematics and management required of a professional mechanical engineer. In the final ½ year students can choose from a range of modules which enables them to follow their areas of particular interest and to prepare them for their initial career.

### Year 1

In year 1 students undertake two engineering science modules (40 credits in total) and a mathematics module (20 credits) which aim to consolidate mathematical and scientific knowledge while introducing the fundamentals of mechanical engineering. The conceptual and analytical focus of this learning is put to work in two substantive integrated projects (total 60 credits) which provide a platform to develop general transferable skills by combining a student's scientific and mathematical competence with a wider range of more subjective knowledge areas, broader intellectual abilities, and practical skills. In this way, students quickly move towards understanding the purpose and power of their conceptual learning, as well as growing their understanding of the kind of problems and challenges mechanical engineers work on. In turn, this builds motivation and engagement.



In year 1, students also complete the Global Engineering Challenge module. This is a week-long project, in which all first-year students in the Engineering Faculty of Engineering tackle real-world problems from a global perspective. This challenges the students to think in an interdisciplinary way about not only the technical issues in engineering developments, but also the social, ethical and environmental implications of decisions made, and their role as change agents.

Year 1 is primarily aimed at bringing all students to a common baseline of knowledge and skills, irrespective of their differing backgrounds so it does not contribute to the final degree grade.

## **Year 2**

During this year, all students undertake five 10-credit modules which aim to develop the fundamentals of mechanical engineering. Two 10-credit mathematics modules are taken to continue the development of essential skills, with a focus on modelling and computational aspects. One 10-credit law and finance module introduces legal and financial aspects of engineering. The year also includes a two-part project (10 credits in the first semester and 20 credits in the second semester) to address a design problem. An electric circuits module contributes 10 more credits.

Students also take part in 'Engineering - You're Hired!' in year 2. During this intensive, week-long project, students work in teams from across the Faculty of Engineering to address a problem proposed by an industrial partner, guided by mentors from industry. During this project, students gain experience of engineering in an industrial setting, developing key employability skills such as managing a complex project within tight constraints, collaborating effectively within interdisciplinary teams and working with a client to achieve common goals.

Students will have a more extensive knowledge and understanding of the main areas of mechanical engineering and also in the appropriate areas of mathematics. They will be applying these to more advanced problems, design activities and laboratory work. They will continue to develop their independent learning, communication skills and their ability to work in teams. They will also be introduced to the business skills required of an engineer.

## **Year 3**

In year 3 students undertake a 30-credit individual Investigative Project and nine 10-credit modules. The Investigative Project is undertaken under the supervision of a member of staff and is usually related to established research work or an industrial problem. It is undertaken over both semesters and provides the student with an excellent opportunity to consolidate the skills and knowledge learnt on the programme during a major piece of individual work. In the first semester students undertake five 10-credit modules aimed at completing the essential education required of a professional mechanical engineer. The modules include integrating modules in the major mechanical engineering subject areas and a further design, management and manufacturing module. In the second semester, an additional 10-credit module looks at the professional responsibility of an engineer and considers ethical, social, legal and environmental issues that are essential for a professional engineer in the modern world. The student can also choose the other three 10-credit modules from a selection of about 10 modules. These are chosen to reflect the individual student's interests and career choice. Advice to students is specifically available from their Personal Tutor and the Year 3 Tutor, although many students seek advice from other members of staff.

One quarter of year 3 (30 credits) is an individual Investigative 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 year 3 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. In the first half of year 3 students will complete the general education required of a professional mechanical engineer in the main mechanical engineering areas, design, management and manufacturing. By this stage students are expected to have become self-motivated, efficient and organised independent learners. In the second half of year 3 students will consider the ethical, social, environmental and legal issues which are the responsibility of a professional engineer, and will be choosing the areas of mechanical engineering, including a possible further related management topic, which will help prepare them for the initial stages of their careers.

### **On successful completion of the programme**

Students will have obtained the academic qualification and practical engineering applications qualification at BEng(Hons) level in preparation for becoming a Chartered Mechanical Engineer. Full Chartered Engineer status will require the completion of an appropriate matching section and experience following graduation. Students will be well prepared for a career in mechanical engineering and also a wide range of other graduate careers. They will be able to assess whether or not they have the ability, motivation and interest to pursue post-graduate training in mechanical engineering.

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

### **21. Criteria for admission to the programme**

Detailed information regarding admission criteria is available via the link below:

[https://www.sheffield.ac.uk/mecheng/prospectiveug/courses/m\\_eng](https://www.sheffield.ac.uk/mecheng/prospectiveug/courses/m_eng)

### **22. 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 (2024)

<https://www.qaa.ac.uk/the-quality-code/qualifications-frameworks#>

University Vision and Strategic Plan

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

### **23. Additional information**

Every student has a Personal Tutor who is a member of staff in the department. Students first meet their Personal Tutor in Intro Week. They see them twice per week during year 1 as they also act as academic tutor for a group of five students for the main mechanical subjects. During year 2 students meet their Personal Tutor three times per semester. In year 3 the arrangements are up to the individual student, however, their Personal Tutor and their Investigative Project Supervisor can be a great help, for example, in advising on module choices, career decisions and providing references. The Personal Tutor is available to provide general help and advice on all aspects of university life.

To assist students in their self-development and continuing professional development the department has introduced a system of Personal Development Planning. This forms the initial basis of the continuing professional development scheme required by the IMechE to record the progress of graduates aiming to become Chartered Engineers.

Further details about the department, courses offered, and admission procedures can be found at the departmental Web site <http://www.shef.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 <http://www.shef.ac.uk/ssid>.