Queen Mary
University of London

PROGRAMME SPECIFICATION (V1)

Degrees:

Programme Title	Final Award	Duration of study/ years	Programme & Route code	Level
Design, Innovation and Creative Engineering	BEng	3	USEF-QM4ENG1/USICE	6
Design, Innovation and Creative Engineering with year abroad	BEng	4	UBEF-QMENNF1/USICY	6
Design, Innovation and Creative Engineering with Industrial Experience	BEng	4	UMEF-QMENNY1/USICI	6
Design, Innovation and Creative Engineering	MEng	4	UMEF-QMENNG1/USICE	7
Design, Innovation and Creative Engineering with year abroad	MEng	5	UMEF-QMENNY1/USICY	7
Design, Innovation and Creative Engineering with Industrial Experience	MEng	5	UMEF-QMENNY1/USICI	7

Ownership	
Awarding institution:	Queen Mary University of London
Teaching institution	Queen Mary University of London
Academic Department(s) involved in programme delivery	School of Engineering and Materials Science (SEMS) Electronic Engineering and Computer Science (EECS)
Main location(s) of study	Mile End Road, London
External references	
QAA Benchmark Group	Engineering
External Accreditor (if applicable)	Institution of Engineering Designers
Accreditation received	18 April 2024

Specification Details	
Programme Lead	Dr Karen Shoop
Student cohorts covered by specification	All cohorts
Date of introduction of programme	September 2014
Date of programme specification / amendment	15 November 2024
Approval by School Education Committee	15 November 2024
Submitted to Directorate of Governance & Legal Services	16 November 2024

1. Programme Overview

Traditionally Design and Engineering programmes have been either Arts or Engineering based. It is becoming increasingly apparent that design graduates need to be both artist and engineer, or at least, be able to understand how they may cross the divide. There is a growing need for designers who are educated as both engineering professionals (who can understand and can apply the latest technological developments), and designers (who understand creative processes, and are able to research and address questions of the contextual relevance and the appropriateness of design). In the Design, Innovation and Creative Engineering (DICE) programmes, design creativity and knowledge of technology are an integral part of the structure.

The programme aims to provide a strong interaction between creativity and human factor design together with practical technology through engineering, materials and process principles, and technology, enabling you to obtain unique interdisciplinary skills to evaluate design problems. The programme combines a balanced diet of design and creative engineering course study work together with a third essential element, an integrated practical studio and workshop application of those studies.

The programme develops knowledge of fundamental creative engineering and design principles to enable graduates to become a design practitioner. The core design studio sessions will encourage multidisciplinary and interdisciplinary design processes, deepening development of intellectual competence and project management skills. These sessions will also develop analytical skills, creative potential, and appreciation of management. To become the developer of a successful innovative product, you will learn, in the context of design development, about technology, materials and the methods of manufacture. You will also gain some appreciation of what is the best strategy to bring the product to market.

A DICE student is a designer who steps back and questions why a problem exists, who discovers overlooked users, and is not someone who just applies skills to solve a problem. The "Design Studio" modules are core to the degree, and benefit from being embedded in an engineering environment. Design Studio encourages students to independently explore their creativity, to understand how they design, gradually focussing on users and usability. To support this they'll employ e.g. CAD skills, electronics & robotics and material science understanding from other modules.

By focussing on understanding and concepts, rather than following procedures, the programme reinforces the design thinking approach fundamental to DICE. A DICE student goes beyond synthesising design concepts: informed by their engineering and materials modules they also explore material properties of their artefacts as well as environmental impact, explain forces and consider manufacturing. The programme will expand your computational confidence, by applying computational techniques with engineering maths, exploring data through code and coding robots. Module leaders will ensure through up-to-date material, linked to QM research, that students engage, rather than listen and follow, and are ready for the unpredictability of the world in the 21st century.

The programme aims to:

- allow students to develop their design creativity, informed by design thinking
- embed student design practice in an engineering and technology environment
- provide an engineering education of a standard recognised to be amongst the highest in UK institutions
- take a multi-disciplinary approach to the elements of engineering, including design

- educate you in the scientific and mathematical principles underpinning engineering
- enable you to achieve your academic potential by providing a stimulating, friendly and supportive environment
- prepare graduates with discipline-specific knowledge and transferable skills that will equip you for employment and continued professional development through self- learning.

The MEng programme additionally aims to develop

- an appreciation of the relative merits and implications including e.g. sustainability, ethical, financial of a proposed engineering solution as they affect those who must put them into practice
- the detailed skills needed for you to undertake an engineering design project in depth, understanding the technical, financial and time limitations

2. Learning outcomes for the programme

In this degree programme we place strong emphasis not only on the technical content of our modules, such as mechanics and design, but also on cross disciplinary skills vital in the 21st century work place. We embed these skills in the creative and technical modules on the programme, to ensure that the technical knowledge and understanding works as you progress through your degree, and also to allow you to graduate with skills you can apply to a range of future careers or higher-level study. We have mapped our modules to a range of attributes that we would like you to develop, within the areas of creativity, resilience, communication, technical and professional practice in order to produce well-rounded, interested and highly employable graduates.

The programme will develop concepts and disciplinary skills related to the academic content and graduate attributes, which are listed below. Over the duration of your programme you will develop the tools to recognise and record your development in these areas.

2.1 Academic Content

BEng

A1	**Core scientific principles.** Understand the core engineering, scientific and mathematical principles needed to underpin Engineering professions and inform design decisions.
A2	**Disciplinary concepts.** Understand, apply and critique a broad range of disciplinary concepts related to Design and Engineering
A3	**Problem solving.** Apply design thinking, creativity and engineering approaches to understand and solve a wide range of problems, relating to users, risks, costs, safety, reliability, aesthetics and environmental impact.
A4	**Key technologies.** Fundamentally understand state-of-the-art technologies related to Design and Engineering.
A5	**Systems design and optimisation.** Design and optimise a broad range of products, processes and systems, based on key technical and sustainability related factors plus user needs
A6	**Experimental design and delivery.** Plan, execute and communicate – through drawing, writing and presentations – the outputs of a design, experiment or project

A7	**Experimental approaches.**Use and integrate a wide range of design thinking, computational and experimental approaches to solve design and engineering problems
A8	**Engineering economics** Understand economic evaluation and business principles relevant to design and engineering
A9	**Engineering responsibility.** Understand the roles and responsibility of designers and engineers in society and their impact on both a local and global context.

MEng

A1	**Core scientific principles.**Understand the core engineering, scientific and mathematical principles needed to underpin Engineering professions and inform design decisions
A2	**Disciplinary concepts.** Understand, apply and critique a broad range of advanced disciplinary concepts related to Design and Engineering
A3	**Problem solving.** Apply advanced design thinking, creativity and engineering approaches to understand and solve a wide range of problems, relating to users, risks, costs, safety, reliability, aesthetics and environmental impact.
A4	**Key technologies.** Fundamentally understand advanced state-of-the-art technologies and understanding their capabilities and limitations related to design and Engineering.
A5	**Systems design and optimisation.**Design and optimise a broad range of products, processes and systems, based on key technical and sustainability related factors plus user needs
A6	**Experimental design and delivery.** Plan, execute and communicate – through drawing, writing and presentations – the outputs of a design, experiment or project.
A7	**Experimental approaches.** Use and integrate a wide range of advanced design thinking, computational and experimental approaches to solve design and engineering problems and be able to interpret the results affected by uncertainties
A8	**Engineering economics.** Understand economic evaluation and business principles relevant to design and engineering.
A9	**Engineeringresponsibility.** Fully understand the roles and responsibility of designers and engineers in society and their impact on both a local and global context.

2.2 SEMS graduate attributes

Five areas related to the graduate attributes you will develop whilst you are study in SEMS have been defined as resilience, creativity, communication, professional practice and technical.

Resilience

In your studies and career there may be times where things do not go exactly how you planned. Being resilient is all about your ability to cope with setbacks and criticism, motivate yourself to overcome obstacles, and stay calm under pressure. You might explore your resilience when reflecting on how you have adapted to a problem-based learning exercise as part of your programme or attend workshops that explore the importance of this skill for your

personal and professional development.

Creativity

You will need to identify real-world problems, explore why this problems exist and design creative approaches to solve them. You may develop your critical thinking abilities when reviewing complex, and sometimes, controversial information from sources, or showcase your creativity by coming up with innovative design approaches in laboratory and practical work.

Communication

Good communication skills are important not only for helping you to express your own ideas but to listen and provide feedback to others. You will be asked to show your ability to communicate information verbally, through drawings, in writing and using other digital technologies to a range of audiences, in both individual and group situations.

Professional practice

From learning about effective ways to manage projects to considering the commercial aspects of developing a new product, you will need a range of knowledge and tools for future success to work in industry and research. You will be able to practice project management approaches through practical work in your modules, which will also develop an awareness of health and safety; you will be introduced to topics such as intellectual property and research ethics.

Technical

The fundamental practical attributes important for engineering careers from manufacturing techniques to the analysis and risk assessment of engineering systems and approaches are included in this area. Programming is increasingly important whether it is coding software such as MATLAB or Python or using other software to model and solve problems. Design projects will test your ability to analyse design challenges as well as complex engineering problems, select appropriate manufacturing techniques to help solve your specific challenge. You will be introduced to computer programming through taught modules and use your knowledge to interpret and model large amounts of data as part of practical assignments and projects.

By the end of their degrees students from SEMS will be able to:

R1	Adversity	Adapt to changes in the face of adversity
R2	Self-worth	Recognise, respect and value the individual worth of yourself
R3	Long-term development	Identify clear personal, study and career goals, taking responsibility for your own development
Cr1	Critical thinking	Evaluate complex or contradictory information, data and processes in order to make judgements and decisions.
Cr2	Problem-solving	Identify and solve real world problems, developing creative solutions with a full awareness of sustainability.

Cr3	Product design	Apply creativity in product and systems design, incorporating different disciplinary and cultural perspectives.
Cr4	Systems	Evaluate, model and improve a range of multifaceted systems.
Co1	Verbal communications	Be effective in verbal communication, develop speaking and listening skills, and provide and receive constructive feedback.
Co2	Written communication	Convey complex technical, professional and other information in written form to suit a range of audiences.
Co3	Communication technologies	Use a range of digital technologies to facilitate effective verbal, graphical and visual communication of technical ideas with engineers, scientists, technicians and a lay audience
Co4	Team work	Work effectively in a team, appreciating different team roles including the leadership.
P1	Project management	Use project management tools and develop skills to deliver projects in industry, research and elsewhere.
P2	Ethics and codes of conduct	Understand and comply with professional engineering and scientific ethics and codes of conduct.
P3	Health and Safety	Understand the importance of health and safety (H&S) from personal, professional and corporate responsibility viewpoints.
P4	Commercial Awareness	Have a working knowledge of intellectual property (IP) considerations and other commercial aspects of product development
P5	Regulation and quality assurance	Have a working knowledge and ability to comply with relevant regulatory frameworks, quality assurance processes and good laboratory practice.
T1	Manufacturing techniques	Evaluate and select the appropriate prototyping and manufacturing techniques
T2	Laboratory and practical techniques	Plan, use and record data from laboratory and workshop techniques pertinent to the discipline of study.
T3	Risk and Uncertainty	Evaluate risk and uncertainty using appropriate statistical methods applied to engineering and scientific problems and other evaluation methods.

T4	Design of experiments	Design tests and experiments to fabricate or synthesise different engineering systems, components or materials, and to measure or monitor their performance or properties.
T5	Computer programming	Use computer programming to model and solve science and engineering problems.
T6	Software tools	Use common software tools for engineering design & analysis

Students who have successfully completed this programmes will:

- be able to apply design thinking when addressing a challenge
- have acquired a body of contemporary factual knowledge incorporating the fundamentals of design and engineering
- have an understanding of the fundamental physical concepts of core technologies so that the limitation of the experimental, mathematical and computational techniques available are fully recognised
- have the ability to analyse and solve problems individually and in groups
- have the ability to communicate knowledge and ideas
- have the enthusiasm and spirit of enquiry for continued learning throughout their careers
- recognise the responsibilities of the professional engineer.

3.1 Learning and teaching approaches

Teaching methods are tailor-made to suit the size of classes, the nature of the subject and the level of study. Each module has a combination of methods including lectures, tutorials, laboratory sessions, industrial visits, workshops and group work. QMUL degrees combine face to face teaching and practical experiences, with supported and structured on-line learning. Our virtual learning platform is referred to as QMplus. Through this platform you will be able to find details about your modules, assessments, timetables and other activities.

Projects throughout the programme are designed for students to exercise independent thinking, research, making and problem solving skills. Group projects enhance students' communication, organisational as well as technical skills.

As a student graduating on the BEng programmes after three years you will be well-prepared to attain the Chartered Engineer status by study of a Matching Section such as an MSc and gaining and evidencing sufficient professional experience, and many do this. Nationwide, these students provide the bulk of engineering graduates for employment, having a broad background in Engineering. However you will not have the in-depth analysis capabilities of the final MEng year, although you can develop this through work experience.

The 4th Year, leading to the MEng degree, consists of advanced subjects and a major. Fourth year options contain material usually covered at postgraduate level and involve specialisation. The 4th Year therefore challenges students to develop and apply their intellectual prowess, problem-solving skills, independence and project-management skills. All these are central to the profile of a well-rounded engineer which industry wishes to see in graduates. Having graduated on the MEng programme, you have satisfied the academic requirements for attaining the Chartered Engineer status and you can apply for this status once you have gained and evidenced sufficient professional experience.

3.2 Employers Links

The school has an active Industrial Liaison forum (ILF). This forum has a direct impact on the programmes by encouraging employers to sponsor and support the students and to provide real design case studies to engage the students throughout the curriculum. Recent case studies that have been taught and assessed were delivered by Bridgestone, DePuy, Baxter, Artis, Corus, BAe, DSTL, Rolls Royce. The ILF takes place twice a year, in Autumn and Spring.

3.3 Assessment methods

You can expect a variety of different types of assessment methods:
Written assessment

- Examination
- Progress tests
- Online assignments, quizzes and tests
- Report and other writing
- Peer assessment
- Practical assessment
- Laboratory/workshop practicals
- Design work
- Programming tests
- CAD & simulation tool tests Oral assessment
- Oral presentations
- Poster presentations
- Group presentations
- Design presentations

Assessments allow you to demonstrate that you have met the intended learning outcomes for each module and contribute towards your achievement of the programme learning outcomes. There are summative (formal) assessments during and/or at the end of each module and well as ongoing formative (informal – no marks) through the degree. Examinations are intended to assess understanding rather than recall. Group assessments may incorporate peer marking.

Assessments operate in accordance with QMUL Regulations and established procedures. Feedback is provided through a number of formats, including:

- Oral (e.g. face to face during or after face-to-face sessions, video)
- Personal (e.g. discussion with staff)
- Interactive (e.g. Team Based Learning, peer-to-peer, online quizzes)
- Written (e.g. solutions, model answers, comments on work)

You will receive feedback on intermediate, developmental assessments such as project plan and progress reports and on coursework assessments. This feedback may be summarised for the whole cohort or be directed towards your work individually

Feedback is intended to help you learn and you are encouraged to engage with it, reflect upon it and discuss it with your module organiser. Feedback will be provided on coursework and practical assessments within an appropriate time. Feedback on examination performance is available upon request from the module leader and overall class performance feedback on a question-by-question basis may also be provided.

3.4 Support of students

We aim to support all students throughout their time with us. We encourage students to develop independently but this does not mean that you need to be alone. We know that support and encouragement from staff and fellow students is very important throughout your degree.

The Student Support Officer for SEMS is the first contact for any personal support; they can be contacted by email: sems-office@qmul.ac.uk with any questions or to arrange an appointment.

3.3.1 Academic Advisor arrangements

As a first year student you will be allocated an Advisor when you register and this Advisor will

normally remain with you for the whole of your time at QMUL. You will meet with your Advisor at least twice per semester, but can always book more meetings if you need help.

3.3.2 Central support services Disability and Dyslexia Service

QMUL has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all QMUL students at all campuses and all sites.

Advice and Counselling

QMUL offers a wide range of advice, guidance and self-help material. These free and confidential professional services are available to all students.

4 Programme structure

Year 1				
Module	Semester	Title		Credit
EMS403U	A&B	Studio Practice Year 1	Core	30
EMS402U	A	Engineering Design	Compulsory	15
EMS412U	A	Computational and Mathematical Modelling 1	Compulsory	15
EMS430U	A	Materials Engineering	Compulsory	15
EMS406U	B	Data and Design	Compulsory	15
EMS450U	B	Exploring Engineering	Compulsory	15
EMS418U	B	Computational and Mathematical Modelling 2	Compulsory	15
EMS499U	A&B	Skills for Engineers	Compulsory	0

Year 2				
Module	Semester	Title		Credit
DEN212	A&B	Studio Practice Module Year 2 Human and Machine	Core	30
EMS522U	A	Materials for Sustainability	Compulsory	15
EMS516U	A	Introduction to Robotics	Compulsory	15
EMS512U	A	Instrumentation and Measurements	Compulsory	15
EMS501U	B	Designing for Sustainable Manufacture	Compulsory	15
EMS527U	B	Materials Processing and Manufacturing	Compulsory	15
EMS511U	B	Robot Design and Mechatronics	Compulsory	15
EMS599U	A&B	Professional Engineering Skills	Compulsory	0

Year 3				
Module	Semester	Title		Credit
DEN327	A&B	Studio Practice Year 3 GDP Industry Related Design Project	Core	30

DEN329	A&B	Studio Practice Year 3 Individual Design Project Joie de Vivre	Core	30
ECS638U	A	Design for Human Interaction	Compulsory	15
EMS627U	A	Modelling and Control of Robotic Systems	Elective	15
EMS619U	A	Biomedical Device Development	Elective	15
EMS622U	B	Sustainability Assessments for Design	Compulsory	15
ECS661U	B	User Experience Design	Compulsory	15

Year 4				
Module	Semester	Title		Credit
EMS700U	A&B	Industry / Research Project	core	60
EMS718U	A	Nanotechnology and Nanomedicine	Elective	15
EMS701U	B	Medical Robotics and Surgical Techniques	Elective	15
EMS726U	A	Engineering Design Optimisation and Decision Making	Elective	15
EMS703U	A	Introduction to Systems Engineering	Elective	15
EMS714U	A	Modern Robotics: Fundamentals and Applications	Elective	15
EMS706U	B	Clinical Sensors and Measurements	Elective	15
EMS719U	B	Medical Ethics and Regulatory Affairs	Elective	15
ECS733U	B	Interactive System Design	Elective	15
EMS729U	B	Cognitive Robotics	Elective	15
EMS705U	B	Environment, Ethics and Economics in Engineering Design	Elective	15
EMS727U	B	Mechatronics	Elective	15

*Students may not take EMS714U if they have previously taken EMS627U.

The credit load for elective modules are to be balanced across semesters.

Students taking programmes which include a year abroad will take an additional year after your Year 2studies

EMS598U	A&B	Engineering Study Abroad	Core	120

Students taking programmes which include an industrial experience year will take an additional yearafter your Year 2, 3 or 4 (MEng only) studies

EMS696U	A&B	Industrial Experience	Core	120

Note: Themodules,structureandassessmentspresentedinthisProgrammeSpecificationare correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You willbe consulted and notified in a timely manner of any changes to this document.

5 Quality assurance

5.1 Student Voice Committee (SVC) meetings

The School has a Student Voice Committee and students on this programme are represented on this committee. The committee meets twice during each semester and is made up of the following members:

- Academic Lead for Student Experience (Chair)
- Student Support Officer (Secretary)
- Relevant academic staff
- At least one student representing each year cohort of the relevant programme

The elections for the undergraduate representatives are organised through the Student Union.
SVC agendas and minutes are found on the SEMS QMPlus landing page (https://qmplus.qmul.ac.uk/course/view.php?idnumber=SEMS-Home).
Relevant items on the minutes are referred to the appropriate School committees, module organisers and programme directors for consideration and feedback.

5.2 Evaluating and improving the quality and standards of teaching and learning

We assess our provision of teaching by:

- Module review by means of student experience questionnaires and module organisers' reports.
- Annual staff appraisal.
- Peer observation of teaching.
- External examiners' reports.
- Periodic Programme Review by the University.

The Committees within SEMS that have responsibility for monitoring and evaluating quality and standards are:

- Education Committee
- Student Experience Committee
- Academic Standards Committee
- Student Voice Committee
- Subject Examination Boards
- Degree Examination Boards

The ways we receive student feedback on the quality of teaching and your learning experience are:

- Annual National Student Survey
- Student Voice Committee
- Student Experience Questionnaire evaluation for each of your modules
- Student forums on QMPlus, including module and programme specific forums as well as ones covering more general topics
- Discussions with Advisors

5.3 Staff development

Our staff are continuously engaging with professional development activities, including courses and workshops related to teaching and learning.