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	MEng	4	UMEF-QMENNG1/USICE	7
Design, Innovation and Creative Engineering with year abroad	MEng	5	UMEF-QMENNY1/USICY	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	2024 (IED accreditation pending)

Specification Details	
Programme Lead	Dr Karen Shoop
Student cohorts covered by specification	2024 entry
Date of introduction of programme	September 2014
Date of programme specification / amendment	17 November 2023
Approval by School Education Committee	22 November 2023
Submitted to Directorate of Governance & Legal Services	11 December 2023

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 financial implications of a proposed engineering solution as they effect those who must put them into practice
- the detailed skills needed for you to undertake a   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	**Engineering responsibility.** 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 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.

The 4th Year, leading to the MEng degree, consists of advanced subjects and a major design project. The project accounts for half of the final year and places a greater demand on the MEng students in terms of their organisational, inter-personal and problem-solving skills than faced in earlier years. In addition to the project, students take four elective modules. 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

3.1 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.

The ILF meets twice a year. The event in October runs in parallel with the SEMS prize day where companies award prizes to more than 30 of our best students.

3.2 Assessment methods
You can expect a variety of different types of assessment methods:

Written assessment
- Examinations
- 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.

QMUL's Policy on Assessment and Feedback and guidance on issuing provisional marks to students is available at: https://arcs.qmul.ac.uk/policy/

3.3 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 Academic Advisor when you register and this Advisor will normally remain with you for the whole of your time at QMUL. During the first year you will meet once a week during a designated timetabled slot. You may be given coursework exercises to bring along to these periods so that your progress can be monitored and supported. The Advisor system is the responsibility of the Director of Student Support.

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: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites. You can access advice, guidance and support in the following areas:
- Finding out if you have a specific learning difficulty like dyslexia
- Applying for funding through the Disabled Students' Allowance (DSA)
- Arranging DSA assessments of need
- Special arrangements in examinations
- Accessing loaned equipment (e.g. digital recorders)
- Specialist one-to-one "study skills" tuition
- Ensuring access to course materials in alternative formats

- Providing educational support workers (e.g. note-takers, readers, library assistants)
- Mentoring support for students with mental health issues and conditions on the autistic spectrum

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. Details can be found at:

https://www.welfare.qmul.ac.uk/student-advice-guides/

3.4 Interruption of Study

The University's Interruption of Study Policy is available on the policy page:

https://arcs.qmul.ac.uk/policy/

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 Year 2, Human and Machine	core	30
EMS522U	A	Materials for Sustainability	compulsory	15
EMS516U	A	Introduction to Robotics	compulsory	15
EMS512U	A	Instrumentation & Measurements	compulsory	15
EMS501U	B	Designing for Sustainable Manufacture	compulsory	15
EMS527U	B	Materials Processing and Manufacturing	compulsory	15
EMS511U	B	Robot Design & Mechatronics	compulsory	15
EMS599U	A&B	Professional Skills for Engineers	compulsory	0

Year 3				
module	semester	title		
DEN327	A&B	Studio Practice Year 3, Group Industry Design Project	core	30

module	semester	title		
DEN329	A&B	Studio Practice Year 3, Individual Design Project	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 Assessment for Design	compulsory	15
ECS661U	B	User Experience Design	compulsory	15
EMS699U	A&B	Advanced Professional Skills for Engineers	compulsory	0

Year 4				
module	semester	title		
EMS723U	A&B	Design and Innovation Year 4 Major Design Project	core	60
EMS718U	A	Nanotechnology and Nanomedicine	elective	15
EMS701U	A	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: Fundamental & 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

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 2 studies

EMS598U	A&B	Engineering Study Abroad	core	120

Note: The modules, structure and assessments presented in this Programme Specification are 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 will be consulted and notified in a timely manner of any changes to this document.

5   Progression and Classification

The degree follows QMUL's Academic Regulations which can be found at:

https://arcs.qmul.ac.uk/policy/. However, please note that to receive an accredited degree programme, students must meet the Engineering Council's regulations which are outlined below. If a student does not meet the EngC requirements below but meets Queen Mary's award requirements, they will graduate with a different degree programme title to distinguish that the programme is not accredited.

5.1 Engineering Council regulations from 2022 entry onwards

BEng

Up to 45 Credits of failed modules are allowed but must be at 30% or above.

MEng

Up to 60 Credits of failed modules are allowed but must be at 30% or above (40% or above at level 7).

5.2 Progression

Requirements for progression between years of study and for classifications of degrees are governed by the Academic Regulations of the Programme at the time of commencement of study.

5.3 Classification

The marks from modules in each year contribute towards the final degree classification. In order to be considered for an award, students must have achieved the minimum number of credits at the required levels prescribed for that award.

Classification will be determined through:
  i. Aggregate Module marks for all modules
  ii. Year Weightings

For the BEng award, Year One is weighted at 10%, Year Two at 30% and Final Year at 60%.

For the MEng award, Year One is weighted at 6.25%, Year Two at 18.75%, Year Three at 37.5% and Final Year at 37.5%.

The University's sets the class of undergraduate degree that are awarded as follows:
  i. First 70.0% or above for the average weighted module results
  ii. Upper Second 60.0% or above for the average weighted module results
  iii. Lower Second 50.0% or above for the average weighted module results
  iv. Third 40.0% or above for the average weighted module results

5.4 Transferring to other programmes.

It is possible to transfer to other programmes following the mechanism described in the undergraduate handbook which requires you to complete a change of programme request form. The request will be reviewed by the Programme Director of the Programme you wish to transfer to, considering your academic performance and reasons for requesting the change.

(https://arcs.qmul.ac.uk/policy/)

Changes between streams may be possible at the end of the completion of your first year, depending on your academic performance, the compatibility of the two programmes of study and capacity of the programme.

6 Entry requirements

Students will be admitted according to the entry requirements found at:

https://www.sems.qmul.ac.uk/ugadmissions/entry/

7 Quality assurance

7.1 Student-Staff Liaison Committee (SSLC) meetings

The School has a Student-Staff Liaison 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:
- Director of Student Experience (Chair)
- Student Support Officer (Secretary)
- Relevant academic staff
- At least one student representing each year cohort of the programme

The elections for the undergraduate representatives are organised through the Student Union. SSLC agendas and minutes are found on the SEMS QMplus landing page (https://qmplus.qmul.ac.uk/course/view.php?id=13091). Relevant items on the minutes are referred to the appropriate School committees for consideration and feedback.

7.2 Evaluating and improving the quality and standards of teaching and learning
We assess our provision of teaching by:
- Module review by means of student feedback questionnaires and course organisers' reports.
- Annual staff appraisal.
- Peer observation of teaching.
- External examiners' reports.
- Periodic Internal Review by the College involving external panel members.
- Periodic Institutional Audit of the College by the Quality Assurance Agency.

The Committees within SEMS that have responsibility for monitoring and evaluating quality and standards are
- Education Committee
- Education Coordination Group
- Student Experience Committee
- Academic Standards Committee
- Teaching Development and Scholarship Committee
- Student-Staff Liaison Committee
- Subject Examination Boards – meet in June to confirm marks and prizes, and to consider progression and awards
- Degree Examination Boards – meet in July to confirm progression and awards
- Engineering and Mathematical Sciences Faculty Board
- University Quality Enhancement Committee.

The ways we receive student feedback on the quality of teaching and your learning experience are:
- Annual National Student Survey
- Student-Staff Liaison Committee
- Student feedback questionnaire evaluation
- Student forums on the School's website, including module and programme specific forums as well as ones covering more general topics
- Discussions with Academic Advisors.

7.5 Staff development

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

8 Supporting Information

All relevant policies including: academic regulations, admissions policy and accreditation of prior learning can be found in the Policy Zone:
https://arcs.qmul.ac.uk/policy/

QMUL is regulated by the Office for Students (OfS) www.officeforstudents.org.uk/advice-and-guidance/the-register/

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.