Programme Title: MEng Sustainable Engineering, MEng Sustainable Engineering with Industrial Experience

Programme Specification

Awarding Body/Institution	Queen Mary University of London
Teaching Institution	Queen Mary University of London
Name of Final Award and Programme Title	MEng (Hons) Sustainable Energy Engineering/MEng (Hons) Sustainable Energy Engineering with Industrial Experience
Name of Interim Award(s)	
Duration of Study / Period of Registration	4/5 years
QM Programme Code / UCAS Code(s)	H224, HG21
QAA Benchmark Group	Engineering
FHEQ Level of Award	Level 7
Programme Accredited by	Institute of Mechanical Engineers
Date Programme Specification Approved	
Responsible School / Institute	School of Engineering & Materials Science

Schools which will also be involved in teaching part of the programme
Centre for Commercial Law Studies

Institution(s) other than Queen Mary that will provide some teaching for the programme

Programme Outline

Engineering is the application of physical science to practical problem solving. Sustainable Energy Engineering is a branch of engineering specifically aimed at developing alternative, renewable and sustainable energy sources and designing the components and equipment needed to utilise them. Its role in the development of the world's economy becomes ever more important in the light of dwindling traditional energy sources and growing environmental threats As a Sustainable Energy Engineer you could be working on anything from a simple component such as an energy efficient light bulb, to more complex machines such as a wind turbine or an entire complex system such as a combined cycle thermal power plant or a fuel-cell powered vehicle.
The MEng degree in Sustainable Energy Engineering is a 4 year programme that part of a suite of programmes offered in Engineering at Queen Mary University of London. MEng programmes are aimed at producing graduates who will have an in depth knowledge of their subject area as well as a wider understanding of its social, economic and environmental impacts and will have the ability to apply this knowledge and understanding in the management of engineering projects.

The Sustainable Energy Engineering degree programmes at QMUL are delivered by a large number of specialist academic staff, who, in addition to their teaching, are involved in internationally recognised research in a wide range of topics, including:

- Energy generation and conversion, including alternative and sustainable sources
- Heat transfer, including thermal insulation and refrigeration
- Computational engineering, both solids and fluids
- Combustion, including renewable fuels
- Materials science, functional materials such as those used in solar panels

The first two years of the Sustainable Energy Engineering programme at QMUL provide a firm grounding in subjects fundamental to all branches of Engineering, including Thermodynamics, Fluid Mechanics, Solid Mechanics and Dynamics. They also provide an insight into process engineering, computing and training in workshop practice. These subjects are developed further in design modules, which run through all four years and include group and individual project work.

The third year gives you the opportunity to specialise in subjects such as Environmental Engineering, Combustion, , Fluid Mechanics and Heat Transfer, Energy Economics and Management of Alternative Energy Sources. It also includes an individual project, which may be a detailed design study, an experimental and/or theoretical investigation, or a critical review of a topic in Sustainable Energy Engineering. The choice of project topic is not prescriptive, and you will be encouraged to choose a topic of mutual interest to you and your supervisor, whose own research interests may involve sustainable and renewable energy sources.

In the fourth year you will undertake further specialised modules as well as a group design project, which emphasises the benefits of teamwork and is often linked to industry. You will learn to function as part of a team and allocate work and responsibilities to team members, as well as developing an industrial link and gaining experience to add to your CV. Where possible projects are multi-disciplinary, with groups including students from other Engineering streams such as Mechanical or Aerospace Engineering or Materials Science. You will also develop many transferable skills and your group will have responsibility for the overall management of the project including its finances.

The Sustainable Energy Engineering MEng degree programmes are accredited by the Institution of Mechanical Engineers (IMechE) and fully meet the benchmark requirements for registration as a Chartered Engineer. Students are entitled to become graduate members of IMechE on graduation. Enrolment as a student member of the IMechE is also encouraged.

Aims of the Programme

The MEng Sustainable Energy Engineering degree programmes at QMUL provide students with the fundamental training needed to become a professional engineer along with the specialist expertise in Sustainable Energy Systems. Graduates are not, however limited to carrers in the energy sector, but will acquire the fundamental skills needed to take advantage of career opportunities in a wide range of industries. The programmes aim to produce graduates who will take on leadership roles and do this by emphasising group project work with industrial involvement and encouraging self-learning and workload management.

They produce graduates:
- with sufficient technical knowledge to undertake roles as engineers across the engineering sector.
- with the personal and interpersonal skills to work closely and communicate effectively with colleagues in a work environment.
- with sufficient management and design knowledge to successfully integrate into and manage engineering projects.

What Will You Be Expected to Achieve?

Graduates from the programme will be expected to have:-

Academic Content:	
A 1	Knowledge of the scientific and engineering principles necessary to underpin an education in Engineering.
A 2	Understanding of mathematical principles underpinning Engineering, in addition to the mathematical methods, tools and notations used in the analysis of Engineering problems.

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A 3	An understanding of concepts from a range of areas including some outside Engineering, and the ability to apply them effectively in the development of alternative and sustainable energy sources.
A 4	An awareness of developing technologies related to the energy sector and in particular to sustainable energy Engineering.
A 5	Knowledge of the regulatory, ethical, economic and environmental issues issues underpinning the Engineering profession, and how an engineer must operate within these.
A 6	Knowledge of the design process and of project management.
A 7	Business and Management skills.
A 8	Knowledge of economic principles underpinning the sustainable energy sector.

Disciplinary Skills - able to:	
B 1	Apply engineering principles to energy related problems.
B 2	Extract data pertinent to an unfamiliar problem, and apply it, particularly in relation to the energy sector.
B 3	Apply quantitative methods and computer software relevant to engineering disciplines, to solve Engineering problems.
B 4	Use fundamental knowledge to investigate new and emerging energy sources.
B 5	Learn new theories, concepts, methods etc. in unfamiliar situations.
B 6	Develop, monitor and update a plan, to reflect a changing operating environment.
B 7	Plan and perform safe experimental work in laboratory settings.
B 8	Work effectively with computing tools for data analysis and processing, as well as modelling, simulation and design.
B 9	Utilise team working and project management skills to effectively work with colleagues on engineering projects and to effectively manage and lead engineering projects.
B 10	Develp proficiency in analytical and computational technologies towards the design or analysis of engineering systems, or solving engineering problems.
B 11	Exercise professional judgement in engineering related problems solving, considering ethical, economic and environmental issues.

Attributes:	
C 1	Engage critically with knowledge, and apply it in a rigorous way.
C 2	Use a range of communication technologies to engage with a range of audiences.
C 3	Critically evaluate the reliability of information from different sources.

C4	Use information for evidence based decision making.
C5	Use quantitative data confidently and competently.
C6	Develop the necessary transferable skills to be effective in the workplace.
C7	Develop an awareness of Health and Safety.
C8	Develop and appreciation for the global energy situation, its historical background and future trends.
C9	Be able to isolate the key facts from complex, often contradictory information.

QMUL Model Learning Outcomes - Level 4:	
D1	Identify and discuss their own career aspirations or enterprise skills and knowledge and how they impact on others
D2	Identify and discuss what their own role in their programme and/or subject discipline might mean to them for future e
D3	Identify and demonstrate the perspectives or problem solving techniques of different disciplines
D4	Demonstrate connections between different theoretical perspectives within your discipline

How Will You Learn?

Teaching materials are delivered through a combination of lectures, problem solving classes, laboratory practicals, and a variety of coursework. In addition problem-based learning plays a role in the your first and second years.
You will undertake a major individual research project in the third year, and a substantive industrially led group research project in the fourth year, both of which are designed to assimilate and utilise knowledge gained throughout the degree towards approaching a real Engineering problem.

The 3rd year project allows you to participate in the specialist internationally-recognised research taking place within the School of Engineering and Materials Science. The 4th year project is a group design project worth half of the final year. These exciting student-led projects are frequently sponsored by industry and provide a valuable insight into real life engineering design and project management.

How Will You Be Assessed?

Assessment is continuous throughout the degree, with written reports, projects, presentations, group work and exams (exams take place in the summer only). The degree programme has eight modules per year split over two semesters, and most are assessed by a combination of coursework and an end of year exam. Some modules, such as the research and design projects, count for two or four modules. In the third and fourth year, you can select from a range of module options allowing you to tailor your degree to specific areas of interest within your specialist degree programme.

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How is the Programme Structured?

Please specify the full time and part time programme diets (if appropriate).

The Sustainable Energy Engineering MEng programme at QMUL is an integrated 4 year programme accredited by the Institute of Mechanical Engineers, which means students can progress to chartered engineer status (CEng). The first three years of the MEng are identical to the three year BEng, with the 4th year providing additional opportunity to specialise, alongside the experience of industrially related group project work.

Whilst at University, you gain a solid foundation in Engineering by studying core Engineering modules such as Mathematics, Solid Mechanics, Design, Dynamics and Fluid Mechanics. In addition, you take specialist Sustainable Energy Engineering modules starting in year 1 and these increase in number throughout the degree programme. In years 3 and 4, you are able to choose your modules from a broad range of Sustainable Energy Engineering module options (see programme structure below). This allows you to tailor your degree programme to match your own Sustainable Energy Engineering interests and career intentions.

We also offer the MEng degree 'with Industrial Experience' where you would take a year working in an Sustainable Energy Engineering related industrial position between your third and fourth years of study. You are paid by the company during this year which also counts towards their degree. If you are not registered on a 'with Industrial Experience' programme you can opt into it at any stage prior to taking your placement. You would extend your studies by a year as you undertake a structured programme at one of our many partner companies. To support this activity we employ a full time Industrial Placement Manager in the School, who supports you through the application process and then manages the programme whilst you are on the placement. Recent placement employers include: DSTL, RollsRoyce, DePuy, Aloca, Microsoft, ARTIS, GE, Caterham F1 & Philips. This exciting opportunity gives you a valuable insight into future careers and enhances employability.

Please see attached programme schematic.

QMUL Model

Students are required to undertake the equivalent of one module (15 credits in 2017/18) per year of study which has been identified as meeting the requirements of the QMUL Model. Each of these modules has been designed to combine the best of QMUL's academic excellence with your ability to identify and develop your skills, networks and experience. This will help to ensure you become a graduate who can undertake further study or secure graduate employment in areas that interest you, and will support your ability to position yourself to find the right job or opportunity for you. The relevant module for your first year of study in 2017/18 is indicated below.

Where more than one module is specified, this is because pertinent elements from these modules have been identified as being appropriate to the QMUL Model and when studied together, deliver the equivalent content of one 15-credit QMUL Model module.

The QMUL Model modules for future years and associated Learning Outcomes will be identified as your studies continue.

Should Professional, Statutory and Regulatory Body requirements apply to your programme of study, these will be taken into account in the specification of QMUL Model requirements.

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Engineering Design Methods	MAT4002	15	4	Compulsory	1	Semester 1	Yes
Mechanics of Fluids I	DEN4101	15	4	Compulsory	1	Semester 1	Yes
Mathematics and Computing for Engineers 1	DEN4122	15	4	Compulsory	1	Semester 1	No
Energy Conversion Systems	DEN4006	15	4	Compulsory	1	Semester 1	No
Mathematics and Computing for Engineers 2	DEN4123	15	4	Compulsory	1	Semester 2	No
Engineering Mechanics: Dynamics	DEN4108	15	4	Compulsory	1	Semester 2	No
Engineering Mechanics: Statics	DEN4102	15	4	Compulsory	1	Semester 2	No
Thermodynamics 1	DEN107	15	4	Compulsory	1	Semester 2	No
Transferable Skills for Engineers and Materials Scientists	MAT4444	0	4	Compulsory	1	Semesters 1 & 2	No

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Design for Manufacture	DEN5101	15	5	Compulsory	2	Semester 1	No
Grad, div and curl: Vector Calculus for Engineering	DEN5122	15	5	Compulsory	2	Semester 1	No
Engineering Instrumentation	DEN5109	15	5	Compulsory	2	Semester 1	No
Energy Conversion Analysis	DEN5107	15	5	Compulsory	2	Semester 1	No
Engineering Materials for Design	DEN5002	15	5	Compulsory	2	Semester 2	No
Solid Mechanics	DEN5102	15	5	Compulsory	2	Semester 2	No

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Control Systems Analysis and Design	DEN5200	15	5	Compulsory	2	Semester 2	No
Heat Transfer and Fluids Mechanics 1	DEN5208	15	5	Compulsory	2	Semester 2	No

Academic Year of Study FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Individual Project	DEN318	30	6	Core	3	Semesters 1 & 2	No
Computer Aided Engineering for Solids and Fluids	DEN331	15	6	Compulsory	3	Semester 1	No
Environmental Properties of Materials	MAT507	15	6	Compulsory	3	Semester 1	No
Heat Transfer and Fluid Mechanics 2	DEN6208	15	6	Elective	3	Semester 1	No
Materials Selection in Design	MAT602	15	6	Elective	3	Semester 1	No
Spacecraft Design: Manoeuvring and Orbital Mechanics	DEN6335	15	6	Elective	3	Semester 1	No
Energy Economics and Management of Sustainable energy	DEN433	15	6	Compulsory	3	Semester 2	No
Environmental Engineering	DEN320	15	6	Compulsory	3	Semester 2	No
Combustion in Automotive Engines	DEN326	15	6	Elective	3	Semester 2	No
Robotics	DEN408	15	6	Elective	3	Semester 2	No

Academic Year of Study FT - Year 4

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Research and Design Team Project	MAT7400	60	7	Core	4	Semesters 1 & 2	No
Renewable Energy Sources	DEN438	30	7	Core	4	Semesters 1 & 2	No
Computational Engineering	DEN401	15	7	Elective	4	Semester 1	No
Vehicular Crashworthiness	DEN411	15	7	Elective	4	Semester 1	No
Advanced Heat Transfer and Fluid Mechanics	DEN7208	15	7	Elective	4	Semester 1	No
Introduction to Law for Science and Engineering	IPLM701U	15	7	Elective	4	Semester 1	No
Advanced Spacecraft Design: Manoeuvring and Orbital Mechanics	DEN7335	15	7	Elective	4	Semester 1	No
Computational Fluid Dynamics	DEN403	15	7	Elective	4	Semester 2	No
Advanced Gas Turbines	DEN427	15	7	Elective	4	Semester 2	No
Whole System Design in Sustainable Engineering	DEN7433	15	7	Elective	4	Semester 2	No
Energy Storage Engineering	DEN7600	15	7	Elective	4	Semester 2	No
Introduction to Solar Energy	DEN7601	15	7	Compulsory	4	Semester 2	No

What Are the Entry Requirements?

Minimum Entry Requirements with A-levels are:
AAA or 360 points from 3 A-levels
Must include maths A-level and at least one science A-level (physics, biology, or chemistry).
Maths A-level must be an A or above

Other qualifications:
International Baccalaureate - 36 points or above overall, with maths and a science (physics, chemistry or biology) at higher level 6
European Baccalaureate - 85% or above including maths and science
French Baccalaureate - 15/20 overall, with 15/20 in maths and science
HE Advanced Diploma - Grade A or above overall, with Maths A-level grade A or above

How Do We Listen and Act on Your Feedback?

The Staff-Student Liaison Committee provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each year of the programme, together with appropriate representation from staff within the School. It is designed to respond to both the general needs of students, and subject specific

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concerns, as well as act as a forum for discussing programme and module developments. Staff-Student Liaison Committees meet regularly throughout the year.

The chair of the SSLC sits on the School's Education and Learning Committee, which advises the School's Director of Taught Programmes on all matters relating to the delivery of taught programmes at School level, and ensures that student feedback is fed into the reviewing of modules and programmes. Student views are also incorporated in the Committee's work in other ways, such as through the National Student Survey (NSS), student module evaluations and module forums. We also use the forums to listen to student feedback on an individual module basis and develop materials and support classes to address comments or requests suggested in the forum.

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Academic Support

Academic support for individual modules is the responsibility of the module organiser and co-organiser(s). These are supported by Teaching Assistants and post-graduate students, many of whom will have studied the modules themselves as undergraduates in the School. In addition there is technician support available for practical sessions.
Academic support for the programme as a whole, including choosing optional modules and possible transfer between programmes is provided in the first instance by the Personal Tutor, with further guidance available from the Senior Tutor and Programme Director, the latter having overall responsibility for the programme structure. The Programme Director in turn reports to the relevant Discipline Teaching Group in the School, the Chair of which is a member of the School's Education and Learning Committee.
We additionally have a School Office, with many student facing staff available to support student learning and one full time Student Support Officer. These staff members will help with coursework submission, time tabling concerns and other general administration as well as providing pastoral support and further guidance on dealing with extenuating circumstances. We also have staff designated to support students in achieving industrial placements and providing careers advice.

Programme-specific Rules and Facts

The Programme operates under the standard QMUL rules for MEng programmes. Students on the "with Industrial Experience" version need a year 1 average of at least 55% to progress to year 2 of the programme. Failure to achieve this will result in a transfer to the version without Industrial Experience.

Specific Support for Disabled Students

Queen Mary 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 Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

Students 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 (e.g. Braille)
- 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.

Links With Employers, Placement Opportunities and Transferable Skills

We place a strong emphasis on supporting our students in achieving quality graduate positions at the end of their degrees. In the first year, all students take a transferable skills module, designed to both support them through the transition to university life, and also introduce the important employability skills they will need in later life. We run an extensive range of employability training events, with weekly timetabled careers slots and field trip visits to more than 20 collaborating companies. Our relationships with both the Careers Group and Student Services are strong in SEMS, and we co-deliver our training in study skills and career development for maximum benefit.

Since 2011 we have had a placement officer working in the school dedicated to supporting our new “with Industrial Experience” programmes which have grown immensely in popularity in the last few years.
The School has run Industrial Liaison Forums (ILFs) each academic year since the School was formed in 2007. Since 2010, the Autumn event is focused on encouraging more industrial participation in our research programmes, rewarding excellence by allowing companies to present student prizes for academic excellence across the School and also as a way of allowing companies and our students to interact through themed panel sessions and a careers fair. The Spring event aims to showcase our best third year project students and all of our group MEng projects. This event again allows extensive networking opportunities between employers and placement providers with all of our students in SEMS. Typically these events are attended by over 50 companies including our regular student prizes sponsors: Tata Steel, Eaton Industries, JRI, GSK, RollsRoyce, Apatech, Morgan Cruicible, ARTIS, NPL, TWI, Becker Coatings; Advanced Healthcare Ltd & Apatech. Many of these companies are also actively engaged in student projects and in addition to these our events are also attended by additional companies that also collaborate with projects such as: Jaguar Land Rover, Alcoa, Perryman, DSTL, BAe, Airbus, Corin, DePuy, Baxter's Healthcare, Norman Foster Partners and many others. In recent times we have extended these events to encourage participation from our more recent alumni as well.

These forums have a direct impact by encouraging employers to sponsor and support the student projects and to provide real engineering case studies to engage the students throughout the curriculum. Many of these companies also support our lecture programme in individual modules. Recent case studies that have been taught and assessed were delivered by companies including Tata, Gillette, Sugru, JRI, DuPuy, Apatech, Artis, BAe, DSTL, Rolls Royce, Perryman and Advanced Healthcare ltd.

Programme Specification Approval

Person completing Programme Specification	Dr Adrian Briggs/ Dr Henri Huijberts
Person responsible for management of programme	Dr Adrian Briggs
Date Programme Specification produced/amended by School Learning and Teaching Committee	31 Jul 2013
Date Programme Specification approved by Taught Programmes Board	