

Programme Title: MSc Sustainable Energy Engineering



Programme Specification

Awarding Body/Institution	Queen Mary University of London
Teaching Institution	Queen Mary University of London
Name of Final Award and Programme Title	MSc Sustainable Energy Engineering
Name of Interim Award(s)	
Duration of Study / Period of Registration	1 calendar year
QM Programme Code / UCAS Code(s)	H2C1
QAA Benchmark Group	Engineering
FHEQ Level of Award	Level 7
Programme Accredited by	IMechE (will be sought)
Date Programme Specification Approved	
Responsible School / Institute	School of Engineering & Materials Science

Schools which will also be involved in teaching part of the programme

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

N/A

Programme Outline

The large projected increases in global population and energy demand, led by those in developing and emerging economies, underscore the need for new workable global supplies of affordable sustainable energy, and elevate this energy need as perhaps the greatest single challenge facing the world in the 21st century. The current acuteness of the challenge results from the confluence of concerns about population growth, energy supply and demand, security, and the effects of energy production and use on the environment. Energy derived from renewable and clean sources holds the promise of addressing the concerns of supply, security and environmental concerns. As a result there is an increasing demand for specialists in Sustainable Energy Engineering. This demand is fuelled by increased public awareness of the energy problem, by tightening of environmental regulations, and by the emerging recruitment needs of manufacturers and energy-supply companies working in the field. To address this demand, this programme has been developed with a view to encouraging science and maths graduates to engage with the subject area, under a UK Government initiative funded by HEFCE. The programme title and employment prospects have been considered, both internally within QM and externally through industrial contacts.

This programme is aimed at students who already have a science background (e.g. biology, mathematics, chemistry, physics), and aims to convert them to engineers with unique expertise in the fundamentals of energy and the environment, and their applications for the benefit of humankind. The programme structure is modular in format. The content of the programme includes a compulsory Engineering Methods module in the first semester, which exposes students to essential engineering

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techniques and philosophy. Besides this module, students will choose three modules from Vector Calculus, Energy Conversion Analysis, Computer Aided Engineering, Advanced Fluid Mechanics and Heat Transfer, Environmental Properties of Materials and Renewable Energy Sources during the first semester. The selection of these three conversion modules depend on the student's background and these modules serve to ensure that the student has the appropriate Engineering background to undertake the specialising modules in the second semester. In the second semester students will take the compulsory modules Energy Storage Engineering and Solar Energy Engineering, as well as two electives from Advanced Environmental Engineering, Advanced Gas Turbines, Computational Fluid Dynamics, Energy Economics and Whole Systems Design.

A 60 credit research project is to be undertaken using our research activities and our state of the art facilities. Several high performance computing clusters owned by the university support a full spectrum of computational research. Our well equipped laboratories include a wide range of IC engines, heat transfer facilities, wind tunnels, an anechoic chamber, a UK CueSim Flight Simulator and France-Price Induction Jet engine test bench, and energy materials synthesis and characterisation labs. support Systems, Aerodynamics and Propulsion research. Nanotechnology research is further supported by the facilities and expertise provided by Nanoforce, a company directly associated with the School.

Aims of the Programme

The programme provides the required curriculum to develop appropriate programme level learning outcomes supporting the development of engineers at postgraduate level, taking in graduate scientists in biology, chemistry, physics and maths. The programme has been developed with a view to encouraging science and maths graduates to engage with the subject area, under a UK Government initiative funded by HEFCE. The programme title and employment prospects have been considered, both internally within QM and externally through industrial contacts.

This programme will develop science graduates to become engineers, concerned with applying scientific knowledge, mathematics and ingenuity to develop solutions for technical, societal and commercial problems. Upon completing of this programme you will be able to perform design and analysis of sustainable energy engineering systems and to develop novel computational and technology products for the sustainable energy engineering industries.

In particular the programme has the following aims.

1. Teaching computational, experimental and analytical techniques applicable to general sustainable energy engineering in order to provide a base of knowledge and skills
2. Teaching computational and experimental techniques applicable to modelling and simulation of sustainable energy systems.
3. Teaching modern design procedures used by the leading sustainable energy research and development units.
4. Teaching environmental engineering in order to provide advanced knowledge and skills applicable to sustainable energy engineering.
5. Teaching materials used in sustainable energy engineering and implementing material into research/design projects.
6. Providing students with insight into developments in sustainable energy engineering.
7. Enabling students to participate in industrial developments in sustainable energy engineering.
8. Introducing the students to selected issues in environment, commerce and law that they may encounter in industry.

What Will You Be Expected to Achieve?

Students who complete this programme will be trained to work in a wide range of industries that develop, design, and maintain sustainable energy systems from full systems to component design and analysis.

Academic Content:

A1	Gain knowledge into finding practical solutions to sustainable energy system problems using advanced computational, experimental and theoretical methods
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A2	Have understanding of the development cycle of novel technologies of sustainable energy engineering and be able to contribute to advanced design developments
A3	Gain knowledge and research capability in core sustainable energy subjects.

Disciplinary Skills - able to:	
B1	apply advanced engineering methods to a range of related applications of sustainable energy systems
B2	select appropriate analysis techniques for sustainable energy systems and system performance assessment
B3	assess feasibility of analytical, computational and experimental techniques in use and propose practical methods for their improvement.

Attributes:	
C1	Engage critically with engineering knowledge and design principles
C2	Be able to assess both the application and limitation of mathematical, computational and experimental techniques available to an engineer.
C3	Demonstrate rounded intellectual development

How Will You Learn?

Through a wide range of different interactions including lectures, tutorials, laboratory classes, exercise classes and project supervisions. It is expected that the programme will demand between 1800 and 2000 hours in total to complete. About 10% of this time will be in scheduled lectures.

A significant amount of independent personal study is anticipated as part of this degree.

How Will You Be Assessed?

The taught modules will be assessed through both coursework and examinations. The details are as outlined in the individual module specifications. The examinations will all take place in the standard college examination periods in January and May. The final project thesis will be assessed in September and the student will also complete a presentation as well as an oral examination.

How is the Programme Structured?

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

A compulsory zero-credit module DENM122 Essential Mathematics Skills for Engineers will be studied pre-sessionally by Distance Learning and in workshops during Semester A. This module will be assessed by coursework only.

60 credits of taught modules will be taught in the first semester from September until December and a further 60 credits of taught modules will be taught in the second semester from January until April. All taught module examinations will be in the standard examination periods during January and May.

A 60 credit Sustainable Energy project will be completed after the examination period in semester 3 (from June - September). Preparation for this research project will begin in the module on Engineering Methods taken in the first semester.

The modules making up the programme are presented in the table below.

In the first semester students will take the compulsory modules DENM114 Engineering Methods and DENM035 Renewable Energy Sources as well as two modules from: DENM512 Grad, div and curl: Vector Calculus for Engineering (*), DENM510 Energy Conversion Analysis (*), DENM331 Computer Aided Engineering for Solids and Fluids (**), DENM208 Advanced Fluid Mechanics and Heat Transfer OR DENM209 Fluid Mechanics and Heat Transfer (**), MTRM040 Environmental Properties of Materials

(*) At most one from DENM512 and DENM510 can be taken.

(**) At most two from DENM512, DENM510, DENM331, DENM209 can be taken.

In the second semester, students take the compulsory modules DENM600 Energy Storage Engineering and DENM601 Introduction to Solar Energy, as well as two modules from: DENM012 Environmental Engineering, DENM022 Advanced Gas Turbines, DENM010 Computational Fluid Dynamics, DENM023 Energy Economics and Management of Sustainable Energy, DENM433 Whole System Design in Sustainable Engineering.

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Engineering Methods	DENM114	15	7	Compulsory	1	Semester 1
Grad, div and curl: Vector Calculus for Engineering	DENM512	15	5	Elective	1	Semester 1
Energy Conversion Analysis	DENM510	15	5	Elective	1	Semester 1
Computer Aided Engineering for Solids and Fluids	DENM331	15	6	Elective	1	Semester 1
Advanced Fluid Mechanics and Heat Transfer	DENM208	15	7	Elective	1	Semester 1

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Environmental Properties of Materials	MTRM040	15	7	Elective	1	Semester 1
Renewable Energy Sources	DENM035	15	7	Compulsory	1	Semester 1
Energy Storage Engineering	DENM600	15	7	Compulsory	1	Semester 2
Introduction to Solar Energy	DENM601	15	7	Compulsory	1	Semester 2
Advanced Environmental Engineering	DENM012	15	7	Elective	1	Semester 2
Advanced Gas Turbines	DENM022	15	7	Elective	1	Semester 2
Computational Fluid Dynamics	DENM010	15	7	Elective	1	Semester 2
Whole System Design in Sustainable Engineering	DENM433	15	7	Elective	1	Semester 2
Research Project in Sustainable Energy	DENM025	15	7	Core	1	Semesters 1-3
Essential Mathematics Skills for Engineers	DENM122	0	4	Compulsory	1	Semester 1
Heat Transfer and Fluid Mechanics	DENM209	15	6	Elective	1	Semester 1

What Are the Entry Requirements?

Minimum of a 2:1 degree or the equivalent international undergraduate degree.

We welcome applications from students with a background in science including Chemistry, Physics, Mathematics and Biology etc.

English at IELTS 6.5 (if needed) – details of equivalent English Qualifications available on the QMUL website.

How Do We Listen and Act on Your Feedback?

The Staff-Student Liaison Committee provides a formal means of communication and discussion between schools/institutes and its students. The committee consists of student representatives from each year in the school/institute together with appropriate representation from staff within the school/institute. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Staff-Student Liaison Committees meet regularly throughout the year.

The School operates an Education and Learning Committee, which advises the School Director of Taught Programmes on all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught

Programmes Board. Student views are incorporated in the committee's work in a number of ways, such as through consideration of student surveys and input from Staff-Student Liaison Committees..

All schools/institutes operate an Annual Programme Review of their taught undergraduate and postgraduate provision. APR is a continuous process of reflection and action planning which is owned by those responsible for programme delivery; the main document of reference for this process is the Taught Programmes Action Plan (TPAP) which is the summary of the school/institute's work throughout the year to monitor academic standards and to improve the student experience. Students' views are considered in this process through analysis of the PTES and module evaluations.

The School participates in the College's Annual Programme Review process, which supports strategic planning and operational issues for all undergraduate and taught postgraduate programmes. The APR includes consideration of the School's Taught Programmes Action Plan, which records progress on learning and teaching related actions on a rolling basis. Students' views are considered in the APR process through analysis of the PTES and module questionnaires, among other data.

Academic Support

During induction the students will be welcomed to the college by the programme leader. Early on in the programme the students will select an project supervisor based upon a wide choice of different project areas. This academic will then also act as a personal tutor. Many of the modules are taught to small classes and so a high level of personal support will also be available from the module organisers in the majority of the taught modules.

Programme-specific Rules and Facts

The programme adheres to the standard Academic Regulations for taught postgraduate programmes.

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

The school has an active Industrial Liaison forum (ILF). This forum has a direct impact on our programmes by encouraging employers to sponsor and support both the students and to provide real design case studies to engage the students throughout the curriculum.

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The ILF meets twice a year. The event in October runs in parallel with the SEMS prize day where prospective employers attend the event, meet MSc and final year undergraduate students discussing opportunities and tips for applications. The new MSc students are encouraged to attend the October event to discuss their projects with industry to forge further ties, where our industrial liaison partners are regularly involved in some of the projects that are of applied research nature. The second industrial forum day takes place in March, where the MSc students are encouraged to meet industrial representatives to discuss potential future employment.

Recent graduates have found employment as IT consultants, specialist engineers, web developers, systems analysts, software designers and network engineers in a wide variety of industries and sectors. A number of students also go on to undertake PhDs in electronic engineering and computer science. Merrill Lynch, Microsoft, Nokia, Barclays Capital, Logica,, Credit Suisse, KPMG, Transport for London, Sky and Selex ES are among the organizations that have recently employed graduates of EECS programmes.

Transferable skills are developed through a variety of means, including embedding of QM Graduate Attributes in taught modules and the summer project, together with the opportunity to participate in extra-curricular activities, e.g. the School's E++ Society, the School's Annual Programming Competition and external competitions with support from the School.

Students have the opportunity to undertake an industrial-linked project in the summer - these are very competitive.

There is also the opportunity to undertake an industrial experience placement, which is highly prized by employers.

Programme Specification Approval

Person completing Programme Specification

Dr Henri Huijberts

Person responsible for management of programme

Prof Magda Titirici

Date Programme Specification produced/amended by School Learning and Teaching Committee

29 Feb 2016

Date Programme Specification approved by Taught Programmes Board