

Programme Title: MSc in Sustainable Energy Systems



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 in Sustainable Energy Systems
Name of Interim Award(s)	PG Certificate / PG Diploma
Duration of Study / Period of Registration	1 calendar year
QM Programme Code / UCAS Code(s)	H2S1
QAA Benchmark Group	Masters degrees
FHEQ Level of Award	Level 7
Programme Accredited by	Institution of Mechanical Engineers (pending)
Date Programme Specification Approved	11 Apr 2016
Responsible School / Institute	School of Engineering and 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

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 Systems. 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.

The programme aims to prepare specialists with unique expertise in the fundamentals of energy and the environment, their applications for the benefit of humankind, and the ability to stay abreast of the field. The programme structure is designed to appeal to students with engineering, sciences or mathematics backgrounds, and is modular in format. The content of the programme includes a compulsory Research Methods and Experimental Techniques module in the first semester. Besides this module, a typical student will also take the module Renewable Energy sources and two more modules from Computational Engineering, Mechanics of Continua and Advanced Fluid Mechanics and Heat Transfer. The selection of the latter two modules depend on the student's background and these modules serve to ensure that the student has the appropriate Engineering and

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Mathematics background to undertake an extensive research project in the Sustainable Energy area. In the second semester the typical student will undertake more modules that further ensure a firm grounding in all aspects of the Sustainable Energy field: Energy Economics and Management of Sustainable Energy, Advanced Environmental Engineering, Renewable Energy Materials, Solar Energy, Energy Storage, Whole System Design, while there is also the option to select modules based on the student's interests and the topic of the research project, from Computational Fluid Dynamics, Advanced Combustion in Reciprocating Engines, Advanced Gas Turbines.

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 aims to prepare specialists with advanced skills in computational modelling, numerical and experimental techniques, and in depth understanding in engineering approaches to sustainable energy systems. Upon completing this programme you will be able to perform design and analysis of sustainable energy systems and to develop novel computational and technology products for the sustainable energy industries while having the capability to understand related issues in environment, economics and management.

In particular the programme has the following aims.

1. Teaching advanced computational, experimental and analytical techniques applicable to general sustainable energy engineering in order to provide an advanced base of knowledge and skills
2. Teaching advanced 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 advanced environmental engineering in order to provide advanced knowledge and skills applicable to sustainable energy engineering.
5. Teaching advanced materials used in sustainable energy systems and implementing material into research/design projects.
6. Providing students with insight into advanced developments in sustainable energy engineering.
7. Enabling students to participate in advanced research and 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. In addition students will have been given an ideal preparation for undertaking a PhD in a related discipline.

Academic Content:

A 1	Gain in-depth knowledge into finding practical solutions to sustainable energy system problems using advanced computational, experimental and theoretical methods
A 2	Have in-depth understanding of the development cycle of novel technologies of sustainable energy systems and be able to contribute to advanced design developments

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A 3	Gain advanced knowledge and research capability in core sustainable energy subjects of thermodynamics, fluid mechanics, heat transfer, combustion and engines, environmental engineering, renewable energy sources and materials.
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Disciplinary Skills - able to:	
B 1	Undertake independent research on a topic relating to sustainable energy systems
B 2	apply advanced engineering methods to a range of related applications of sustainable energy systems
B 3	optimally select analysis techniques for sustainable energy systems and system performance assessment
B 4	critically assess feasibility of analytical, computational and experimental techniques in use and propose practical methods for their improvement.

Attributes:	
C 1	Engage critically with knowledge.
C 2	Be able to understand both the application and limitation of mathematical, computational and experimental techniques available to an engineer.
C 3	Undertake independent research using state of the art processing, characterisation and testing facilities.
C 4	Research Capacity and Information expertise.
C 5	Understand the application and use of sustainable energy technology in related engineering subjects.

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 period in May. The final project thesis will be assessed in September and the student will also complete a presentation as well as an oral examination.

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How is the Programme Structured?

60 to 75 credits of taught modules will be taught in the first semester from September until December and a further 45 to 60 credits of taught modules will be taught in the second semester from January until April. Overall 120 credits of taught modules have to be taken. All taught module examinations will be in the standard examination period during May.

A 60 credit Sustainable Energy Engineering research 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 Research Methods taken in the first semester.

Academic Year of Study 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Research Methods and Experimental Techniques in Engineering	DENM014	15	7	Compulsory	1	Semester 1
Computational Engineering	DENM004	15	7	Elective	1	Semester 1
Grad, div, curl: Vector Calculus for Engineering	DENM512	15	5	Elective	1	Semester 1
Renewable Energy Sources	DENM035	15	7	Elective	1	Semester 1
Energy Economics and Management of Sustainable Energy	DENM023	15	7	Elective	1	Semester 2
Computational Fluid Dynamics	DENM010	15	7	Elective	1	Semester 2
Advanced Combustion in Reciprocating Engines	DENM021	15	7	Elective	1	Semester 2
Advanced Gas Turbines	DENM022	15	7	Elective	1	Semester 2
Advanced Environmental Engineering	DENM012	15	7	Elective	1	Semester 2

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Research Project in Sustainable Energy	DENM025	60	7	Core	1	Semesters 1-3
Energy Storage Engineering	DENM600	15	7	Elective	1	Semester 2
Introduction to Solar Energy	DENM601	15	7	Elective	1	Semester 2
Advanced Heat Transfer Fluid Mechanics	DENM208	15	7	Elective	1	Semester 1
Environmental Properties of Materials	MTRM040	15	7	Elective	1	Semester 1
Whole System Design in Sustainable Engineering	DENM433	15	7	Elective	1	Semester 2

What Are the Entry Requirements?

The entry requirement is that the student to have secured at least a high 2ii (>55%) BEng degree or equivalent qualification in engineering, science or an equivalent academic programme and supporting references. A minimum of IELTS 6.5 or equivalent is required for non-native English speakers.

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.

Each school/institute operates a Learning and Teaching Committee, or equivalent, which advises the School/Institute 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 student membership, or consideration of student surveys.

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.

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

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the course coordinators in the majority of the taught modules.

Programme-specific Rules and Facts

The programme follows the standard QMUL guidelines for MSc delivery.

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.

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.

Programme Specification Approval

Person completing Programme Specification

Henri Huijberts

Programme Title: MSc in Sustainable Energy Systems

Person responsible for management of programme

Magda Titirici

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

11 Apr 2016

**Date Programme Specification approved by
Taught Programmes Board**

11 Apr 2016