

Programme Specification

MSc Energy and Sustainability (2020-21)

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

Awarding Institution	University of Southampton
Teaching Institution	University of Southampton
Mode of Study	Full-time
Duration in years	1
Accreditation details	Accredited by Joint Board of Moderators as meeting the requirements for Further Learning for a Chartered Engineer (CEng) candidate who has a partial CEng undergraduate first degree
Final award	Master of Science
Name of Award	Energy and Sustainability/Energy, Environment and Buildings Energy and Sustainability/Energy, Resources and Climate Change
Interim Exit awards	Postgraduate Certificate Postgraduate Diploma
FHEQ level of final award	Level 7
UCAS code	N/A
Programme Code	3959, 3960
QAA Subject Benchmark or other external reference	QAA Subject Benchmark – Engineering 2015; Accreditation of Higher Education Programmes, Edition 3, Engineering Accreditation Board Characteristic Statement: Master's Degree, QAA 2015
Programme Lead	Abubakr Bahaj

Programme Overview

Brief outline of the programme

This MSc programme relates energy to the environment that we live and work in and the current and projected impacts of climate change. Students learn from an energy perspective how development has led to the fossil fuel dominated societies that exist today. Transition pathways to low carbon, renewable futures are explored across scales of the dwelling, neighbourhood, city and country.

The MSc takes a three stage 'resource' – 'converter technology' – 'demand' approach to analysis of problems across the three pillars of sustainability (1) economic, (2) social and (3) environmental. Workshop activities bring these stages together to enable the development of solutions for cities and countries.

Students are challenged to develop concepts to address multi-faceted development problems. There is a strong focus on group work tasks, developing the key teamwork skills that industry requires. You will often be expected to present your ideas to an assessment panel, as you would as a consultant tendering for a contract. Field trips provide a real-world context to the concepts developed in lectures. You will have the opportunity to explore the power of big data in an energy context through statistical analysis.

The programme is accredited by the Joint Board of Moderators and meets the further learning requirements to become a Chartered Civil Engineer.

Please note: As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources. As a result, this programme may be revised during a student's period of registration; however, any revision will be balanced against the requirement that the student should receive the educational service expected. Please read our Disclaimer to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's programme validation process which is described in the University's Quality handbook.

Your contact hours will vary depending on your module/option choices. Full information about contact hours is provided in individual module profiles.

Learning and teaching

Acquisition of core knowledge and understanding is through lectures, seminars, tutorials, field and laboratory classes, workshops, and independent study and research. You are encouraged from an early stage to supplement and consolidate your understanding and knowledge by independent study. The MSc uses a broad range of learning and teaching methods. In a classroom environment these include lectures, short period breakout group tasks, interactive discussions and workshops. The 'Democratisation of Energy, SESG6041' and 'City Rezoning, CENV6145' are good examples. Feedback is provided on all work submitted.

Fieldtrips provide real world insight, enabling students to translate concepts discussed in lectures to case study sites. Examples include, Weald and Downland Open Air Museum (CENV6147), Fawley Power Station (SESG6041), Eling Tide Mill (SESG6041), Hampshire waste water treatment plant and Poundbury (CENV6145).

Assessment

Testing of the knowledge base and development of skills is through a combination of unseen written examinations and assessed coursework in the form of problem-solving exercises, design exercises, essays and individual projects.

Assessment methods are a mix of exams and coursework (LO EA6M, EA5M, EA7M) balanced between individual and group work. Exams enable students to demonstrate a comprehensive understanding of the scientific principles (LO SM7M). Questions are a mix of shorter problems assessing core understanding (LO SM7M, SM9M) and longer, open ended tasks where students have the ability to demonstrate a deeper understanding and critical thinking (LO SM8M).

The ability of students to present their work is assessed through poster presentations and individual and group formal presentations / reports (LO P11m, G1, G2, G3m, G4). Group work alongside the dissertation assesses management and research analysis skills (LO EA7M, D9M, D10M, D11M). Engineering practice is assessed through group work on specific briefs such as the 'Tide Mill' and '2 countries to 80% renewables' tasks (LO P9m, P10m, P11m). Sustainability and ethical practice and general skills are assessed throughout the programme, driven by the brief of numerous courseworks and the dissertation study (LO EL8M, EL9M, EL10M, EL11M, EL12M, EL13M, G1, G2, G3m, G4).

Special Features of the programme

There are a number of special features to the programme aimed at building a cohort identity, supporting students, particularly international, and improving the student experience and learning opportunity. These include:

1. Induction week activities, including a group outdoor activity aimed at promoting interaction between the students on the MSc Energy and Sustainability. Photo Challenge on day 1 of the introduction module (SESG6041).
12. This programme includes a number of workshops and field trips. These include the 3 day 'Democratisation of Energy' workshop where the challenges of delivering energy policy in terms of fairness, acceptability and cost are explored.
2. Large group work tasks such as 'The Island Project' enable students to apply and extend their knowledge to solve complex, multi-disciplinary problems.
3. Co-creation of dissertation ideas / concepts with academic staff through a workshop.

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should receive the educational service expected. Please read our [Disclaimer](#) to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's [programme validation process](#) which is described in the University's [Quality handbook](#).

Educational Aims of the Programme

The aims of the programme are to:

- ☐ Support you to develop a sound understanding of the fundamental principles, methods, analysis and synthesis in engineering design and applications appropriate to Energy and Sustainability.
- ☐ Through a range of specialist modules integrated within the structured learning environment, reflecting the internationally-renowned research expertise within the School, enable you to broaden and deepen your knowledge, skills and abilities.
- ☐ Align your career pathway with the requirements for chartered engineer status.
- ☐ Offer you a degree structure that is relevant to industry and responsive to changes in technology and the needs of the community.
- ☐ Embed you with a supportive and intellectually stimulating environment that encourages an attitude of independent learning and enquiry, and fosters an ethos of lifetime learning and professional development.
- ☐ Assist you in developing research projects which are supported by the research activities within the Faculty and stimulate individual innovation, self-assessment and teamwork skills required in engineering.
- ☐ Afford you the opportunity of applying theoretical knowledge gained on the programme through a substantial piece of research (dissertation).

Programme Learning Outcomes

The programme provides opportunities for you to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the areas detailed below. The programme learning outcomes have been developed with reference to the [Subject Benchmark Statement for engineering](#) and the [Characteristics Statement for Master's Degrees](#). The former of these is aligned with the Engineering Council publication Accreditation of Higher Education Programmes (AHEP): [UK Standard for Professional Engineering Competence](#) (third edition)

Learning outcomes listed are AHEP 3 Learning Outcomes: Technical and 'Non-Technical' MSc programmes which provide further learning (FL) to partly meet the educational requirement for CEng.

Having successfully completed this programme you will be able to demonstrate knowledge and understanding of:

Disciplinary Specific Learning Outcomes

On successful completion of this programme you will be able to:

- E1. Design and conduct an appropriate programme of work to set objectives for research in the context of Energy and Sustainability
- E2. Use scientific and technical literature in support of research
- E3. Apply fundamental knowledge and understanding of essential facts, concepts and principles relevant to Energy and Sustainability in researching complex problems

Science and Mathematics

Engineering is underpinned by science and mathematics, and other associated disciplines, as defined by the relevant professional engineering institution(s). On graduation you will have achieved:

- SM7. A comprehensive understanding of the relevant scientific principles of Energy and Sustainability
- SM8. A critical awareness of current problems and/or new insights most of which is at, or informed by, the forefront of aerodynamic and computation
- SM9. Understanding of concepts relevant to Energy and Sustainability, some from outside engineering, and the ability to evaluate them critically and to apply them effectively, including in engineering projects

Engineering analysis

Engineering analysis involves the application of engineering concepts and tools to the solution of Acoustical Engineering problems. On graduation you will have achieved:

- EA5. Ability to use fundamental knowledge to investigate new and emerging technologies
- EA6. Ability both to apply appropriate engineering analysis methods for solving complex problems in engineering and to assess their limitations
- EA7. Ability to collect and analyse research data and to use appropriate engineering analysis tools in tackling unfamiliar problems, such as those with uncertain or incomplete data or specifications, by the appropriate innovation, use or adaptation of engineering analytical methods

Design

Design at this level is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges and can be used to integrate all engineering understanding, knowledge and skills to the solution of real and complex problems. On graduation you will have the knowledge, understanding and skills to:

- D9. Knowledge, understanding and skills to work with information that may be incomplete or uncertain, quantify the effect of this on the design and, where appropriate, use theory or experimental research to mitigate deficiencies
- D10. Knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations
- D11. Ability to generate an innovative design for products, systems, components or processes to fulfil new needs

Economic, legal, social, ethical and environmental context

Engineering activity can have impacts on the environment, on commerce, on society and on individuals. Graduates therefore need the skills to manage their activities and to be aware of the various legal and ethical constraints under which they are expected to operate, including:

- EL8. Awareness of the need for a high level of professional and ethical conduct in engineering
- EL9. Awareness that engineers need to take account of the commercial and social contexts in which they operate
- EL10. Knowledge and understanding of management and business practices, their limitations, and how these may be applied in the context of Energy and Sustainability
- EL11. Awareness that engineering activities should promote sustainable development and ability to apply quantitative techniques where appropriate
- EL12. Awareness of relevant regulatory requirements governing engineering activities in the context of Energy and Sustainability
- EL13. Awareness of and ability to make general evaluations of risk issues in the context of Energy and Sustainability, including health & safety, environmental and commercial risk

Engineering practice

This is the practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills. On graduation you will have achieved:

- P9. A thorough understanding of current Energy and Sustainability practice and its limitations, and some appreciation of likely new developments
- P10. Ability to apply engineering techniques taking account of a range of commercial and industrial constraints
- P11. Understanding of different roles within an engineering team and the ability to exercise initiative and personal responsibility, which may be as a team member or leader

P12. Advanced level knowledge and understanding of a wide range of engineering materials and components

Additional general skills

On graduation you will have developed transferable skills, additional to those set out in the other learning outcomes, that will be of value in a wide range of situations, including the ability to:

- G1. Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities
- G2. Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
- G3. Monitor and adjust a personal programme of work on an on-going basis
- G4. Exercise initiative and personal responsibility, which may be as a team member or leader

Teaching and Learning Methods

Acquisition of core knowledge and understanding is through lectures, seminars, tutorials, field and laboratory classes, computer classes, workshops, and independent study and research. You are encouraged from an early stage to supplement and consolidate your understanding and knowledge by independent study.

Intellectual skills are developed through the teaching and learning activities. Analysis and problem-solving skills are further developed through regular problem sheets issued by module lecturers and through small group teaching. Experimental, research and design skills are further developed through coursework exercises, laboratory work, and design and research projects. Individual feedback is provided on all work submitted. Appreciation of the practical applications of these skills is provided by interaction with industry through visiting lectures and industrial visits.

Assessment methods

Testing of the knowledge base is through a combination of unseen written examinations and assessed coursework in the form of problem-solving exercises, laboratory reports design exercises, essays and individual and group projects.

Analysis and problem-solving skills are assessed through unseen written examinations and problem-based exercises. Experimental, research and design skills are assessed through laboratory reports, coursework exercises, project reports and oral presentations. Skills are formatively assessed through written reports and oral presentations, practical and laboratory reports. Summative assessment is through unseen examinations, extended essays, written reports and oral presentations, and completion of a research project.

Programme Structure

The programme structure table is below:

Information about pre and co-requisites is included in individual module profiles.

Where optional modules have been specified, the following is an indicative list of available optional modules, which are subject to change each academic year. Please note in some instances modules have limited spaces available.

Energy, Environment and Buildings Pathway

Part I

The information below is liable to change in minor ways from year to year. It is accurate at the time of writing.

Both Energy and Sustainability themes (3959 Energy, Resources and Climate Change, and 3960, Energy, Environment and Buildings) have a common semester 1 of four compulsory modules. Choose one optional module in semester 2 alongside the three compulsory modules.

The research component of the MSc consists of a Core module (FEEG6012) of 30 ECTS/60 CATS which is a research dissertation.

Where optional modules have been specified, the following is an indicative list of available optional modules, which are subject to change each academic year. Please note in some instances modules have limited spaces available.

Part I Compulsory modules

Code	Module Title	ECTS	Type
CENV6147	Climate Change, Energy and Settlements	7.5	Compulsory
CENV6145	Climate Design of Buildings and Cities	7.5	Compulsory
FEEG6025	Data Analysis & Experimental Methods for Civil and Environmental Engineering	7.5	Compulsory
CENV6148	Energy Performance Assessment of Buildings	7.5	Compulsory
CENV6090	Energy Resources and Engineering	7.5	Compulsory
ENVS6032	Geographical Information Systems for Environmental Consultants	7.5	Compulsory
SESG6041	Introduction to Energy Technologies, Environment and Sustainability	7.5	Compulsory

Part I Core modules

Code	Module Title	ECTS	Type
FEEG6012	MSc Research Project	30	Core

Part I Optional modules

Plus 15 credits

(ONE MODULE) from:

Code	Module Title	ECTS	Type
CENV6141	Bioenergy	7.5	Optional
CENV6085	Waste Resource Management	7.5	Optional

The programme structure table is below:

Information about pre and co-requisites is included in individual module profiles.

Where optional modules have been specified, the following is an indicative list of available optional modules, which are subject to change each academic year. Please note in some instances modules have limited spaces available.

Energy, Resources and Climate Change Pathway

Part I

The information within this Appendix is liable to change in minor ways from year to year. It is accurate at the time of writing.

Both Energy and Sustainability themes (3959 Energy, Resources and Climate Change, and 3960, Energy, Environment and Buildings) have a common semester 1 of four compulsory modules. Choose one optional module in semester 2 alongside the three compulsory modules.

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Where optional modules have been specified, the following is an indicative list of available optional modules, which are subject to change each academic year. Please note in some instances modules have limited spaces available.

Part I Compulsory modules

Code	Module Title	ECTS	Type
CENV6141	Bioenergy	7.5	Compulsory
CENV6147	Climate Change, Energy and Settlements	7.5	Compulsory
FEEG6025	Data Analysis & Experimental Methods for Civil and Environmental Engineering	7.5	Compulsory
CENV6090	Energy Resources and Engineering	7.5	Compulsory
ENVS6032	Geographical Information Systems for Environmental Consultants	7.5	Compulsory
SESG6041	Introduction to Energy Technologies, Environment and Sustainability	7.5	Compulsory
CENV6085	Waste Resource Management	7.5	Compulsory

Part I Core modules

Code	Module Title	ECTS	Type
FEEG6012	MSc Research Project	30	Core

Part I Optional modules

Plus 15 credits

(ONE MODULE) from:

Code	Module Title	ECTS	Type
CENV6145	Climate Design of Buildings and Cities	7.5	Optional
CENV6148	Energy Performance Assessment of Buildings	7.5	Optional

Progression Requirements

The programme follows the University's regulations for [Progression, Determination and Classification of Results : Undergraduate and Integrated Masters Programmes](#) or [Progression, Determination and Classification of Results: Postgraduate Master's Programmes](#). Any exemptions or variations to the University regulations, approved by AQSC are located in [section VI of the University Calendar](#).

Support for student learning

There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular Faculty or discipline area.

The University provides:

- library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- high speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations.
- computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- standard ICT tools such as Email, secure filestore and calendars.
- access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library.
- Enabling Services offering support services and resources via a triage model to access crisis management, mental health support and counselling. Support includes daily Drop In at Highfield campus at 13.00 – 15.00 (Monday, Wednesday and Friday out of term-time) or via on-line chat on weekdays from 14.00 – 16.00. Arrangements can also be made for meetings via Skype.
- assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia)
- the Student Services Centre (SSC) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- Career and Employability services, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV.
- Other support that includes health services (GPs), chaplaincy (for all faiths) and 'out of hours' support for students in Halls and in the local community (18.00-08.00).
- A Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers.

The Students' Union provides

- an academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.
- opportunities for extracurricular activities and volunteering
- an Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline.

There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular School or discipline area.

The University provides:

- Library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources. There is a wide range of online training and workshops available to support writing, study skills, IT and maths. The Academic skills hub holds several workshops every week day to support students.
- High speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations. Students can also access SVE (Southampton Virtual Environment), a virtual Windows University of Southampton desktop

that can be accessed from personal devices such as PCs, Macs, tablets and smartphones from any location.

- Computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources).
- Standard ICT tools such as Email, secure filestore and calendars.
- Access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- Central IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library.
- Enabling Services offering assessment and support (including specialist IT support) facilities if you have a disability, dyslexia, mental health issue or specific learning difficulties.
- The Student Services Centre (SSC) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards.
- Career and Employability services, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV.
- A range of personal support services: mentoring, counselling, residence support service, chaplaincy, health service.
- A Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers.

The Students' Union provides

- An academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.
- Opportunities for extracurricular activities and volunteering.
- An Advice Centre offering free and confidential advice including support if you need to make an academic appeal.
- Support for student peer-to-peer groups, such as Nightline.

In the School of Engineering and your Discipline you will be able to access:

- Student handbook for Civil Engineering students.
- Introductory sessions for all years of the programme.
- Library information retrieval seminar.
- Engineering Development and Manufacturing Centre (EDMC) equipped with a range of workshop equipment, CAD/CAM.
- Engineering specific software.
- Personal academic tutors to assist you with personal problems and to advise on academic issues (contact maintained during periods of studying abroad). A Senior Tutor is also available should you need additional support.
- Access to academic staff through an open door policy as well as timetabled tutor meetings, appointment system and e-mail.
- Research seminars and invited lectures.
- School Student Office for the administration of your programme.

Methods for evaluating the quality of teaching and learning

You will have the opportunity to have your say on the quality of the programme in the following ways:

- Completing student evaluation questionnaires for each module of the programme.
- Acting as a student representative on various committees, e.g. Staff/Student Liaison Committees, School Programmes Committee OR providing comments to your student representative to feedback on your behalf.
- Serving as a student representative on Faculty Scrutiny Groups for programme validation.
- Taking part in programme validation meetings by joining a panel of students to meet with the Faculty Scrutiny Group.

Further details on the University's quality assurance processes are given in the [*Quality handbook*](#).

Career Opportunities

Student graduating from our MSc degrees obtain employment as graduate engineers with many leading employers both consultants and contractors and also regulatory authorities and local authorities. Support is available to develop their CVs and interview skills. In addition to careers in civil engineering, the transferrable skills that our students obtain make them attractive to a wide range of graduate recruiters, from financial services through to IT and management consultancy.

External Examiner(s) for the programme

Name: Prof Tim O'Doherty - Cardiff University

Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff: Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality assurance process.

External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their Personal Academic Tutor in the first instance.

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if they take full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook.

Appendix 1:

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme also have to pay for:

Additional Costs

Type	Details
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In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at www.calendar.soton.ac.uk.