



Programme Specification

A statement of the knowledge, understanding and skills that underpin a taught programme of study leading to an award from
The University of Sheffield

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| 1 | Programme Title | Environmental and Energy Engineering |
| 2 | Programme Code | CPET01 / CPET90 |
| 3 | JACS Code | H800 |
| 4 | Level of Study | Postgraduate |
| 5a | Final Qualification | Master of Science in Engineering (MSc(Eng)) |
| 5b | QAA FHEQ Level | Masters – 7 |
| 6 | Intermediate Qualifications | Postgraduate Certificate (PGCert), Postgraduate Diploma (PGDip) |
| 6b | FHEQ Level | Masters - 7 |
| 7 | Teaching Institution (if not Sheffield) | Not applicable |
| 8 | Faculty | Engineering |
| 9 | Department | Chemical and Biological Engineering |
| 10 | Other Departments involved in teaching the programme | Not applicable |
| 11 | Mode of Attendance | Full-time |
| 12 | Duration of the Programme | 1 year |
| 13 | Accrediting Professional or Statutory Body | Energy Institute, Institution of Chemical Engineers |
| 14 | Date of production/revision | November 2019 |

15. Background to the programme and subject area

Public concern about processes which affect the environment will continue to influence almost all industrial operations over the next decade and beyond. Waste disposal, energy production and the minimisation of pollution are the key problems that must be addressed for the sustainable cities of the future. In a world of finite resources and witnessing a population explosion, much effort is being made to change the way in which developed societies consume energy and materials and dispose of waste. The MSc (Eng) in Environmental and Energy Engineering (EEE) meets the need for the next generation of engineers and scientists to be aware of the issues surrounding this very sensitive and often controversial field. The practical engineering issues surrounding environmental impact and the often neglected underlying factors governing energy conservation and maximised efficiency (a pre-requisite to reduced emissions) are outlined throughout the programme. All material is taught by staff who are actively involved with and working in this field.

This Masters programme provides students with a thorough understanding of environmental and energy engineering by combining theoretical aspects of the discipline with hands-on practical experience which ensures that our graduates are well-equipped to enter and succeed in a wide range of career areas and to meet the challenge of working within an ever-changing discipline. In particular, the programme provides an increased breadth and depth of study beyond that of the BEng level, with additional emphasis on industrial relevance, team/group working, an increase in the use of industrially-relevant applications of engineering analysis, and an enhanced capability for independent learning and work.

The Department has four internationally leading research themes: Biological Engineering, Processes and Systems, Materials & Products and Sustainability. The main core modules offered on this programme reflect the research interests/expertise of members of staff in these groups. Masters students are required to carry out a novel research project in one of these research areas.

The Masters programme is accredited by Energy Institute & Institution of Chemical Engineers as the “Matching Section” under the Engineering Council’s SARTOR III regulations. As such, candidates with a suitable first degree are able to complete the academic requirements for Professional Membership and Chartered Engineer status through Energy Institute & IChemE.

All students are encouraged to become student members of the Institution of Chemical Engineers and/or the Energy Institute. Both professional bodies have active local branches which organise seminars and visits. Further information about the Department and the programme can be found at <http://www.shef.ac.uk/cbe>.

16. Programme aims

The University's Mission is to provide students from a wide variety of educational and social backgrounds with high-quality education in a research-led environment using staff working at the frontiers of academic enquiry. The Department of Chemical and Biological Engineering implements this through its strong commitment to both teaching and research. It also aims to engender in its students a commitment to future self-learning and social responsibility.

The specific aims of the MSc in Environmental and Energy Engineering programme are to:

1. Provide access to an engineering degree to students from a range of academic and social backgrounds;
2. Prepare students for a professional career in industry, education, public and commercial sectors;
3. Develop interpersonal skills appropriate to a professional person;
4. Encourage students to think for themselves, work effectively on their own initiative, and develop a social awareness;
5. Provide experience in conducting extended individual projects;
6. Develop the students' ability to make technical decisions;
7. Provide students with an education through a firm understanding and practical knowledge in environmental and energy engineering;
8. Allow students to obtain a broad knowledge and deep understanding in environmental & energy areas.

17. Programme learning outcomes

Knowledge and Understanding: Students will have developed knowledge and understanding of:

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| K1 | the science appropriate to the discipline of environmental and energy engineering; |
| K2 | the impact of design on environmental/energy issues; |
| K3 | the environmental/energy implications of engineering materials and components; |
| K4 | professional and ethical responsibilities including codes of practice and the regulatory framework and the global and social context of environmental/energy engineering; |
| K5 | operational practice of environmental protection equipment; |
| K6 | requirements for safe operation, the nature of hazards and their operation; |
| K7 | relevant engineering practice and its limitations and have an appreciation of likely new developments; |
| K8 | the ability to integrate knowledge of mathematics, science, information technology, design, business context and engineering practice to solve a substantial range of environmentally oriented engineering problems. |

Skills and other attributes:

Intellectual Skills – students will be able to:

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| I1 | use scientific principles: in the development of engineering solutions to practical problems; in the modelling and analysis of environmental/energy systems, processes and products; |
| I2 | undertake technical and environmental risk evaluation; |
| I3 | produce solutions to problems through the application of environmental/energy engineering knowledge and understanding; |
| I4 | make use of computer based models for solving problems in engineering, and be able to assess the limitations of particular cases; |
| I5 | assimilate data from a wide range of sources, extract that which is pertinent to an unfamiliar problem, and apply this to a particular problem. |

| Practical Skills – students will be able to: | |
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| P1 | make use of relevant test and measurement equipment in experimental laboratory work; |
| P2 | undertake practical testing of design ideas in the laboratory or through simulation, with technical analysis and critical evaluation of results; |
| P3 | apply engineering techniques taking account of industrial and commercial constraints; |
| P4 | effectively manage their time in the context of research project; |
| P5 | understand the design methodologies, engineering and IT tools related to energy and environmental engineering and apply and adapt them in unfamiliar situations; |
| P6 | research and use new methods required for novel situations and adapt to specific purposes as necessary. |

| General Transferable Skills – students will be able to: | |
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| T1 | undertake manipulation sorting and presentation of data; |
| T2 | make use of scientific evidence based methods in the solution of problems; |
| T3 | make use of general IT tools; |
| T4 | work with limited or contradictory information and apply creativity and innovation to the solving of problems; |
| T5 | manage time and resources and effectively communicate as a team member and demonstrate leadership skills; |
| T6 | understand concepts from a range of areas, and the ability to apply them effectively in technical and business decisions; |
| T7 | integrate presentational techniques and the information to be presented for maximum impact; |
| T8 | work with the minimum of supervision, being proactive in their approach to learning and be able to: <ul style="list-style-type: none"> • be innovative in the use of a broad range of scientific principles in solving engineering problems; • develop, monitor and update a plan to reflect a changing operating environment; • monitor and adjust a personal programme of work on an on-going basis and can learn independently. |

18. Teaching, learning and assessment

Development of the learning outcomes is promoted through the following teaching and learning methods:

The main teaching, learning and assessment methods adopted for each learning outcome are shown below.

Lectures – used to transmit information, explain theories and concepts, and illustrate methods of analysis or design. For most lecture courses tutorial sheets are provided to enable students to develop their understanding during private study.

Practical classes – students undertake laboratory experiments and computing to gain practical skills.

Tutorials and example classes –to help students with their understanding and to resolve problems in their programme materials.

Research projects – individual project contributing to novel research in environmental and energy engineering.

In most cases a combination of methods is used. Formal lectures are the principal means of imparting knowledge, and understanding is gained through a combination of tutorials, example classes and coursework assignments. Knowledge and understanding are primarily assessed in written examinations. However further knowledge and understanding is gained through project work and assessed in written reports and oral presentations. Skills are acquired mainly through coursework and individual or group projects.

The programme also provides a number of opportunities for personal development, including the interaction with those working in the field, during lectures and workshop sessions, and by encouraging responsibility in the decision making process, often when confronting complex industrial scenarios.

In addition to planned teaching and learning activities, students are also expected to learn through the preparation of coursework assignments and other assessment activities which generally require students to seek additional information and work on their own, or in small groups, to develop further understanding of the subject matter.

| LEARNING OUTCOME (abbreviated - see Section 17 for full text) | Teaching/Learning | | | | | Assessment | | | | | | |
|---|-------------------|--------------------------|------------------------------|-------------------------|---------------|------------|-----------------------------|--------------------|-----------------|--------------------------|--------------------|----------------------|
| | Formal Lectures | Formal Subject Tutorials | Practical Laboratory Classes | Individual Project Work | Private Study | | Formal written examinations | Laboratory reports | Project reports | Individual presentations | Course Assignments | Personal Development |
| K1 science appropriate to discipline | • | • | • | • | • | | • | • | • | • | • | |
| K2 the impact of design | • | • | | • | • | | • | • | • | • | • | |
| K3 environmental/ energy implications | • | • | | • | • | | • | • | • | • | • | |
| K4 professional and ethical responsibilities | • | | | • | • | | • | | • | • | • | |
| K5 operational practice | • | • | | • | • | | • | • | • | • | • | |
| K6 requirement for safe operation | • | | • | • | • | | • | • | • | • | • | |
| K7 relevant engineering practice | • | • | • | • | • | | • | • | • | • | • | |
| K8 the ability to solve problems | • | • | | • | • | | | | • | • | • | |
| | | | | | | | | | | | | |
| I1 use of scientific principles | • | • | • | • | • | | • | • | • | • | • | |
| I2 environmental risk evaluation | • | • | | • | • | | | • | • | • | • | |
| I3 produce solutions to problems | | • | | | • | | | | • | • | • | |
| I4 use of computing packages | | • | | • | • | | | • | • | • | • | |
| I5 extract data & find solution | | | • | • | • | | • | • | • | • | • | |
| | | | | | | | | | | | | |
| P1 use of test equipment | | | • | • | • | | | • | • | | | |
| P2 Undertake practical testing of design | | • | • | • | | | | • | • | • | • | |
| P3 Apply eng. techniques | | • | | • | | | | • | • | • | • | |
| P4 Time management | | | | • | | | | • | • | • | • | |
| P5 Apply design techniques | • | • | | • | | | | • | • | • | • | |
| P6 research new methods | • | | | • | | | | • | • | • | • | |
| | | | | | | | | | | | | |
| T1 manipulation of data | • | • | • | • | • | | • | • | • | • | • | |
| T2 use of scientific methods | | | • | • | • | | | • | • | • | • | |
| T3 use of general IT tools | | | • | • | • | | | • | • | • | • | |
| T4 working with limited data | | | • | • | • | | | | • | • | • | |
| T5 resource management | | | | • | • | | | | • | • | • | |
| T6 Understanding of concepts | | | | • | • | | | | • | • | • | • |
| T7 presentational techniques | | | | • | • | | | | • | • | • | • |
| T8 work independently | | | | • | • | | | | • | • | • | • |

Opportunities to demonstrate achievement of the learning outcomes are provided through the following assessment methods:

Written examinations – unseen examinations.

Coursework submission – designed to test knowledge and communication skills; these include design studies, computing assignments and laboratory reports.

Class tests – tests conducted in a lecture theatre during the main teaching periods to assess progress.

Oral presentations – The research projects and some taught modules include an oral presentation.

Individual project reports – these include intermediate and final reports for the Research Project and some taught modules.

19. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements

<http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code/subject-benchmark-statements>

Framework for Higher Education Qualifications

<http://www.qaa.ac.uk/publications>

University Strategic Plan

<https://www.sheffield.ac.uk/ourplan/>

Learning and Teaching Strategy (2016-21)

<https://www.sheffield.ac.uk/staff/learning-teaching/our-approach/strategy2016-21>

'Accreditation of Chemical Engineering Programmes based on Learning Outcomes', Institution of Chemical Engineers, September 2015.

'Academic Standards – Engineering', Subject Benchmark Statement, Quality Assurance Agency for Higher Education, 2015.

In assessing students' achievement of the learning outcomes, the level of performance, e.g. the extent of knowledge and depth of understanding, will be compliant with guidance given in the above references.

20. Programme structure and regulations

In common with most degrees at the University of Sheffield, the programme of study is modular in nature allowing students a certain level of flexibility in the design of their degrees. Postgraduate taught modules offered by the Department are usually 15 credits, which is nominally equivalent to 150 hours of work by a student. Of this between 30 and 40 hours are usually contact time and the remainder directed/private study. Credits are accumulated by obtaining a mark of at least 50 in the assessment for the module.

Students studying for the award of Masters are required to take modules to the value of 180 credits, comprising 5 compulsory 15-credit modules, a choice of three optional modules of 15 credits each, and a 60-credit supervised research project. The credits will be divided between both semesters. Students who do not successfully complete the full Masters programme are eligible for either the award of Postgraduate Diploma if they have accumulated 120 credits from the study of taught modules or the award of Postgraduate Certificate if they have accumulated 60 credits.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual modules are published in the University Calendar available online at

<http://www.sheffield.ac.uk/calendar>.

21. Student development over the course of study

Students will study current issues at the forefront of Environmental and Energy Engineering. Their knowledge and understanding of professional issues and management will be enhanced. They will carry out an individual research project and demonstrate an ability to carry out independent research and critically evaluate the results. They will display levels of creativity, originality and judgment expected of Masters' degree graduates and, upon successful completion of the programme, will have developed and demonstrated achievement of the overall programme outcomes outlined in Section 17 and met the aims given in section 16.

22. Criteria for admission to the programme

Detailed information regarding admission to programmes is available from the University's On-Line Prospectus at <http://www.sheffield.ac.uk/study/>.

The programme is designed for students with a first degree (or equivalent) in engineering or science who wish to specialise or enhance their knowledge of this area of environmental/energy technology either before entering the field or after gaining some practical experience.

At least a 2.2 degree or equivalent is acceptable to the University, in a suitable subject. International students are also required to offer a suitable language qualification, such as IELTS (minimum overall score 6.5 with no individual score less than 5.5). Successful candidates may be required to attend an English Language course in the University before or during the programme.

The Department expects "Matching Section" accreditation only to apply to those students who have a first degree or equivalent acceptable to Energy Institute and IChemE who should be consulted as to eligibility.

23. Additional information

Further information is available in the MSc Environmental & Energy Engineering programme brochure from the Department of Chemical and Biological Engineering or online at <http://www.shef.ac.uk/cbe/pg>.

This specification represents a concise statement about the main features of the programme and should be considered alongside other sources of information provided by the teaching department(s) and the University. In addition to programme specific information, further information about studying at the University of Sheffield can be accessed via our Student Services web site at www.shef.ac.uk/ssid.