

## Programme Specification

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### MSc Advanced Chemical Engineering (2019-20)

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	
Final award	Master of Science (MSc)
Name of Award	Advanced Chemical Engineering
Interim Exit awards	Postgraduate Certificate Postgraduate Diploma
FHEQ level of final award	Level 7
UCAS code	N/A
Programme Code	8288
QAA Subject Benchmark or other external reference	Engineering 2010, Master's Degree Characteristics 2016, QAA Framework for Higher Education Qualifications (FHEQ) 2008
Programme Lead	Andrea Russell (aer1)
Pathway Lead	

## Programme Overview

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### Brief outline of the programme

Modern Chemical Engineering covers a vast range of applications and scales, from the traditional oil and gas industry through to micro-reactors. There is an increased focus on sustainability through the use of alternate feedstocks and management of energy as well as the increased use of smaller scale and on-demand production. This programme aims to provide chemical engineering graduates with training at increased depth in process control and instrumentation, an increased understanding of sustainability, and to allow specialisation through the choice of optional modules.

The modules which comprise this masters degree involve state-of-the-art reactor design, advanced understanding of safety and risk management, using both industry standard tools and facilities in our research laboratories. You will have the opportunity to select two optional modules to suit your interest. You will undertake a group design project in which the design challenge has been set in consultation with members of our Industrial Advisory Board to provide real-world context. Your individual research project is undertaken over the third semester.

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

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### Learning and teaching

The different subject matter of the modules lends itself to different teaching and learning techniques. These include lectures, seminars, laboratory classes, coursework and projects. Throughout the programme, students are encouraged to refer to the recommended reading material to broaden their understanding of the relevant subjects.

All postgraduate students have access to an extensive library of reference material, including dissertations by former students, help with careers destinations and computer suites, including a comprehensive selection of software.

Many modules include assessed coursework assignments for which students are required to carry out a substantial study of selected topics, individually or in groups. Students are assessed on their ability to use rationally the taught material and show an in-depth understanding of the subject matter. Feedback on progress is given to students on all submitted work.

### **Assessment**

Assessment is through a combination of examination, coursework, assignments, presentations and dissertation. The programme comprises two semesters of formal instruction, followed by a research project, which may be undertaken in collaboration with a company.

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.

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## **Special Features of the programme**

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A feature of this programme is the opportunity to conduct your individual research project either on placement, working with a company, or co-supervised by a company. The availability of such research projects will vary, and allocation will be by application and interview during the first semester of study.

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## **Educational Aims of the Programme**

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The aims of the programme are to enable you to:

- Develop original ideas and solve complex problems in new or unfamiliar environments, based on advanced knowledge of process control, reactor design, and sustainability in Chemical Engineering.
- Integrate knowledge and handle complexity, formulating sound judgements with incomplete or limited data.

- Communicate your conclusions and the underpinning knowledge and rationale clearly and unambiguously to specialist and non-specialist audiences.
- Develop your independent learning skills as required for continued professional development.

## **Programme Learning Outcomes**

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### **Knowledge and Understanding**

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On successful completion of this programme you will have knowledge and understanding of:

- A1. The scientific and engineering principles underpinning the design and operation of chemical engineering processes.
- A2. Awareness of the social, economic, environmental and regulatory impact of the operation of chemical engineering processes in a sustainable manner
- A3. Critical ability, as demonstrated by a research project/dissertation which advances a specific area of research
- A4. Sufficient breadth of technical background to permit study of the current literature and technical reports or specifications, identification of gaps in information, and engagement in discussion with peers and a wide ranging audience

### **Teaching and Learning Methods**

A1, A2, A3, A4. Most modules consist of a combination of lectures, small group teaching, practical work, directed reading and coursework assignments. At the end of the taught part of the course you will undertake an individual project within a research group or in industry. The MSc dissertation and several courseworks contain a literature review component. Small group teaching, including all practical work, and the individual project accommodate different learning styles. One-on-one tutorials can support full-class lectures, when required.

### **Assessment Methods**

A1, A2, A3, A4. Your knowledge and understanding of each subject will be assessed through a combination of written examinations and coursework. The proportion of examinations to coursework varies between modules. Depending on your choice of modules, about 50% of your marks will be derived from coursework, with the individual project assessed by dissertation. Assessment is through a combination of unseen written examinations and assessed coursework in the form of problem solving exercises, laboratory reports with literature review components, design exercises, and individual and small-group projects.

## **Subject Specific Intellectual and Research Skills**

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

- B1. Approach problem solving by identifying information needs and assembling information from different sources, in order to build a clear overall picture of a complex problem and potential solutions.
- B2. Evaluate different types of information critically in a variety of formats (including published research, technical manuals, and standards).
- B3. Make use of existing theories and concepts and be able to apply them independently to new problems

and situations.

- B4. Synthesise and analyse information and ideas, and apply creative and original thought in order to propose appropriate new solutions to complex problems.

### **Teaching and Learning Methods**

B1, B2, B3: Design skills are developed through individual practical work and the individual project. Modelling, simulation and verification are taught in various modules and applied through coursework components. The practical work includes modelling, design, directed reading and coursework assignments, which can contain a literature review.

B4, B5: The Project Preparation module and the Individual Project itself concern the formulation of a research project. Small group teaching, including all practical work, and the individual project accommodate different learning styles. One-on-one tutorials can support full-class lectures, when required.

### **Assessment Methods**

B1, B2, B3, B4, B5. Design skills are assessed in examination questions and in coursework. Modelling, simulation and verification form a significant aspect of the coursework in the design projects.

B4. The Project Preparation module and the dissertation from the MSc Project include a significant literature survey and have assessment criteria to reflect this specifically.

B5. The Project dissertation is centrally focussed on assessing the difference aspects of research skills.

### **Transferable and Generic Skills**

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

- C1. Learning: independent study and skills development
- C2. Problem solving: recognition, definition, analysis and solution.
- C3. Awareness of your present knowledge limitations, and readiness to gain new knowledge through further study and teamwork in your professional field
- C4. Information processing (including IT skills): literature searching, abstracting documents and collating information for the purposes of technical writing.
- C5. Data manipulation (including IT skills): analysis of data, application of statistical methods and interpretation of results.
- C6. Communication: oral and written presentation of information, technical writing.
- C7. Individual: decision-making, initiative taking, self-motivation and direction, personal responsibility.
- C8. Management: safe and effective project planning and execution, time management (more highly developed for MSc through research project).
- C9. Teamwork.

### **Teaching and Learning Methods**

A number of courses have a significant coursework element. This can range from design work through to presentations resulting from directed reading. The individual project includes independent research, project management and report writing.

C1-C3: Most modules include small group teaching, practical work with one or more lab partners, directed reading and coursework assignments with a literature review component. The Project Preparation module includes project management and the delivery of a project plan via a presentation. Small group teaching, including all practical work, and the individual project accommodate different

learning styles. C4: The individual project includes independent research and report writing.

### Assessment Methods

Coursework is generally assessed through written reports. The individual project is assessed by a dissertation of up to 15,000 words. The Project Preparation module is assessed via a literature review, as well as written and presentation versions of the project plan.

### Subject Specific Practical Skills

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

- D1. Scientific computing skills in using computational tools and packages for the solution of engineering problems.
- D2. Skills in technical writing, research planning and execution through full-time work on a research project.
- D3. Skills in searching and using scientific and technical literature effectively.

### Teaching and Learning Methods

D1, D2, D3, D4: These skills will be developed through coursework and project work. Most modules include practical work, ranging from electronic lab activities, hands-on practicals to simulation laboratories. The individual project will involve one or more subject specific practical skills, with one-to-one training delivered by the supervisory team or technical staff.

### Assessment Methods

Assessment is based on coursework in the form of laboratory reports and the MSc dissertation.

### Programme Structure

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The programme structure table is below:

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

### Pathway

Part I

Part I Compulsory

Code	Module Title	ECTS	Type
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SESG6036	Advanced Control Design	7.5	Compulsory
FEEG6013	Group Design Project	22.5	Compulsory
ISVR6147	Professional Aspects of Engineering	7.5	Compulsory
CHEM6159	Reactor Design for Sustainable Processing	7.5	Compulsory

#### Part I Core

Code	Module Title	ECTS	Type
FEEG6012	MSc Research Project	30	Core

#### Part I Optional

Code	Module Title	ECTS	Type
CENV6141	Bioenergy	7.5	Optional
CENV6090	Energy Resources and Engineering	7.5	Optional
ELEC6204	Microfluidics and Lab-on-a-Chip	7.5	Optional
CHEM6158	Reaction Engineering in Micro- and Meso- Scale Flow	7.5	Optional
SESM6040	Thermofluid Engineering for Low Carbon Energy	7.5	Optional
CENV3059	Urban Water and Wastewater Engineering	7.5	Optional
CENV6158	Wastewater Process Engineering	7.5	Optional

#### Part I Optional - SESA3030

This module is compulsory if not met by prior learning. The requirements for students to take this module will be assessed at the time of the offer of a place on the course

You must not take this module if you are not required to.

Code	Module Title	ECTS	Type
SESA3030	Aerospace Control Design	7.5	Compulsory

## Progression Requirements

The programme follows the University's regulations for [\*Progression, Determination and Classification of Results : Undergraduate and Integrated Masters Programmes\*](#) and [\*Progression, Determination and Classification of Results: Postgraduate Master's Programmes\*](#) as set out in the University Calendar: <http://www.calendar.soton.ac.uk/sectionIV/sectIV-index.html>

## 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.

## Methods for evaluating the quality of teaching and learning

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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, Faculty Programmes Committee OR providing comments to your student representative to feed back 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.

The ways in which the quality of your programme is checked, both inside and outside the University, are:

- Regular module and programme reports which are monitored by the Faculty.
- Programme validation, normally every five years.
- External examiners, who produce an annual report.
- Professional body accreditation/inspection
- A national research evaluation exercise (our research activity contributes directly to the quality of your learning experience).
- Institutional Review by the Quality Assurance Agency.

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

## Career Opportunities

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After successfully graduating from this MSc programme, you may consider a career path in the Chemical Engineering industry, either at a production facility or in consulting in the UK or abroad. The programme also provides an excellent basis upon which to go on to further study for a PhD in Chemical Engineering or a related discipline.

## External Examiner(s) for the programme

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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 s/he takes 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
Clothing	<p>Additional safety equipment will be provided where necessary.</p> <ul style="list-style-type: none"> <li>- Lab Coats</li> <li>- Protective Clothing: Hard hat; safety boots; hi-viz vest/jackets;</li> </ul> <p>Fieldcourse clothing:</p> <ul style="list-style-type: none"> <li>- You will need to wear suitable clothing when attending field courses, e.g. waterproofs, walking boots. You can purchase these from any source.</li> </ul>
Stationery	You will be expected to provide your own day-to-day stationary items, e.g. pens, pencils, notebooks, etc.). Any specialist stationery items will be specified under the Additional Costs tab of the relevant module profile.
Textbooks	<p>Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source.</p> <p>Some modules suggest reading texts as optional background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies. Although not essential reading, you may benefit from the additional reading materials for the module.</p>
Approved Calculators	Candidates may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University approved models are Casio FX-570 and Casio FX-85GT Plus. These may be purchased from any source and no longer need to carry the University logo.
Optional Visits (e.g. museums, galleries)	Some modules may include additional optional visits. You will normally be expected to cover the cost of travel and admission, unless otherwise specified in the module profile.
Equipment and Materials	<p>Design equipment and materials:</p> <p>Standard construction/modelling materials will be provided where appropriate, unless otherwise specified in a module profile. For customisation of designs/models calling for material other than standard construction/ modelling materials, students will bear the costs of such alternatives.</p> <p>FEEG6012 Reasonable expenses for travel and materials of up to £300 may be reclaimed through the Faculty Student Office. For project costs in excess of £300 students should discuss possible sources of funding with their supervisor and should not proceed with any expenditure until a further funding source has been agreed.</p> <p><a href="https://www.southampton.ac.uk/courses/modules/feeg6012.page">https://www.southampton.ac.uk/courses/modules/feeg6012.page</a></p>
Printing and Photocopying Costs	<p>In some cases, coursework and/or projects may be submitted electronically. Where it is not possible to submit electronically students will be liable for printing costs, which are detailed in the individual Module Profile.</p> <p>FEEG6012 Students are expected to cover the costs associated with the printing and binding of reports, including any drawings and graphic presentations. Two copies will need to be submitted. Depending on the quality of printing and binding chosen students can expect to pay approximately £25-30 per copy, totalling approximately £50-60 for both copies.</p> <p><a href="https://www.southampton.ac.uk/courses/modules/feeg6012.page">https://www.southampton.ac.uk/courses/modules/feeg6012.page</a></p>

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](http://www.calendar.soton.ac.uk).

