Programme Title: MSc in Computational Engineering

Programme Specification (PG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	MSc in Computational Engineering
Name of interim award(s):	
Duration of study / period of registration:	1 year
QMUL programme code(s):	
QAA Benchmark Group:	Engineering
FHEQ Level of Award:	Level 7
Programme accredited by:	IMechE, RAeS
Date Programme Specification approved:	
Responsible School / Institute:	School of Engineering & Materials Science

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

NA

Collaborative institution(s) / organisation(s) involved in delivering the programme:

NA

Programme outline

Computational Engineering is a strongly growing field in Engineering. In their drive for competitiveness manufacturing companies are developing integrated virtual design chains that build on computational engineering tools, spanning the disciplines and integrate into complete design management systems.
Students will be introduced to the current industrial practice and can deepen their interest by choosing a project in this area.
The Programme focuses on developing the students' core computational skills with modules in scientific programming, Computational Structural Mechanics/Dynamics (CSM/CSD, FEM), and Computational Fluid Dynamics (CFD). These core modules are complemented by advanced engineering modules which put these core skills into practice.

Aims of the programme

The program provides advanced training in the core computational methods for structures (CMS), fluids (CFD). A particular strength of SEMS is the strong research track record in Numerical Optimisation, which is the third core module. Elective modules are chosen from a large list of modules. The student can either focus on an application area, choosing advanced engineering modules from the area of specialisation, or can can focus on advanced skills in generic computational methods. Compared to

Programme Title: MSc in Computational Engineering

the prevalent UK MSc programmes, the MSc in Computational Engineering has a 90 credit project over the entire year, rather than a 60 credit project in the Summer term. This enables a much stronger focus on the project research.
Research projects in Computational Engineering are drawn from a wide variety of applications in all of the specialisation areas, reflecting the strong research links that the staff members have with industrial companies such as Airbus, Alstom, Rolls Royce, TWI, VW.

What will you be expected to achieve?

You will acquire broad training in scientific analysis, engineering modelling and numerical methods to be able to design, carry out and evaluate the results of computational models of engineering problems.
You will conduct a substantial research project of current engineering relevance using state of the art methods. The knowledge and skills you gain in the taught and the research part of the programme will enable you to seek employment in industrial Research and Development teams, as well as conduct further research in a PhD.

Academic Content:	
A 1	Advanced knowledge of modelling across Mechanical, Aerospace and Chemical Engineering. Introduction to the relevant modern approaches to numerical modelling and analysis in Engineering.
A 2	Advanced knowledge of computational fluid dynamics, computational structural simulation, programming and numerical optimisation.
A 3	Research and communication skills: including detailed knowledge on numerical simulations, as well as numerical optimisation.

Disciplinary Skills - able to:	
B 1	Use a range of scientific software and computational tools for solid/fluid mechanics analysis and optimisation.
B 2	Carry out an individual research project in computational engineering, including the ability to assimilate published knowledge and advance a subject area through research.
B 3	Analyse, evaluate and interpret the results of numerical analyses and research results. Prepare scientific/technical reports of an appropriate professional standard.

Attributes:	
C 1	Apply scientific knowledge and problem-solving skills in a wide range of theoretical and practical situations.
C 2	Be able to assess the relevance, importance and reliability of the ideas of others.
C 3	Engage critically with engineering knowledge and design principles.

How will you learn?

You will be taught by a team of dedicated computational engineering specialists as well as academics from other fields of Engineering from the school.

Queen Mary University of London

Programme Title: MSc in Computational Engineering

Acquisition of knowledge is achieved mainly through lectures and directed independent learning. Understanding is reinforced through a combination of workshops and problem classes, tutorials and laboratory classes (depending upon the module concerned), which include provision of regular feedback on submitted assignments. Additional learning support is made available through Queen Mary's online learning environment (QMplus), via the provision of various primers and guidance notes, online recordings and other supplementary learning materials. A range of software is available through the QMUL Student PC environment.

The programme can be completed in one-year on a full-time basis. The programme is comprised of compulsory and elective modules. You will also complete an extensive individual research project which is made up of a piece of individual research, and must include some element of originality and will use a range of computational techniques to analyse the problem you are studying.

How will you be assessed?

Assessment of the academic content of the programme is generally through a combination of unseen written examinations and assessed coursework. The exact nature of the coursework varies from module to module, but may include work in the form of problem sheets, essays or other types of written assignments. The coursework mark may also include a contribution from computer-based assessments and in-course tests.
In addition, the extended research project will be assessed by a written report on research techniques, a final report on the specific research project and a two-to-one viva examination.

How is the programme structured?

Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

Students are required to register for six taught modules (15 credits each), including compulsory modules in computational engineering, computational fluid dynamics and numerical optimisation in engineering design.
In addition, students will do an individual project (90 credits), to commence in September but with the majority of the work (approximately 60 credits worth) being done over the summer.

Sem A:
Core: Extended Research Project
Compulsory: DENM004.
Elective: 2*15 credits
Sem B
Core: Extended Research Project
Compulsory: DENM010, DENM026.
Electives 1*15 credits
Sem C
Core: remaining 60 credits of Extended Research Project.

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester

Queen Mary University of London

Programme Title: MSc in Computational Engineering

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Extended Research Project	DENM100	90	7	Core	1	Semesters 1-3
Computational Engineering	DENM004	15	7	Compulsory	1	Semester 1
Computational Fluid Dynamics	DENM010	15	7	Compulsory	1	Semester 2
Numerical Optimisation in Engineering Design	DENM026	15	7	Compulsory	1	Semester 2
Advanced Heat Transfer and Fluid Mechanics	DENM208	15	7	Elective	1	Semester 1
Vehicular Crashworthiness	DENM033	15	7	Elective	1	Semester 1
Renewable Energy Sources	DENM035	15	7	Elective	1	Semester 1
Computer Aided Engineering for Solids and Fluids	DENM331	15	6	Elective	1	Semester 1
Grad, div and curl: Vector Calculus for Engineering	DENM512	15	5	Elective	1	Semester 1
Topics in Scientific Computing	MTH739N	15	7	Elective	1	Semester 2
Advanced Flight Control and Simulation of Aerospace Vehicles	DENM001	15	7	Elective	1	Semester 2
Advanced High Speed Aerodynamics	DENM405	15	7	Elective	1	Semester 2
Aeroelasticity	DENM032	15	7	Elective	1	Semester 2
Robotics	DENM011	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

What are the entry requirements?

High 2:2 (>55%) BEng or BSc degree or equivalent qualification is required, usually in subjects with substantial Maths or Physics content. Relevant subjects can be Engineering (including Mechanical, Aerospace, Chemical or similar). If core engineering modeling concepts such as fluids and structures have been covered, students from Computer Science, Mathematics or Physics

Queen Mary University of London

can also apply,. Non relevant degree subjects may be considered if there is evidence of sufficient study in Maths/Physics/ Engineering or related modules.
A minimum of IELTS 6.5 or equivalent is required for non-native English speakers.

How will the quality of the programme be managed and enhanced?

At Institutional level, the programme will be managed and enhanced through an Annual Programme Review.
At School level, the Programme will be managed by a Programme Director, who sits on the School's Education Board, chaired by the School's Director of Education.
The day-to-day running of the Programme will be monitored by the School's Student Experience Group.
Additionally, student feedback (via SSLC and Module Evaluations) will be considered.

How do we listen to and act on your feedback?

The Postgraduate Taught Programmes Staff-Student Liaison Committee (SSLC) provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each MSc Programme and appropriate representation from staff within the school. It is designed to respond to the needs of students, as well as to act as a forum for discussing programme and module developments. The SSLC meets regularly throughout the year.
In addition, students sit on a variety of School committees concerned with Education provision.
More immediate concerns and issues can be addressed via online forums (at module, programme and School level), anonymous suggestion boxes and via personal tutors and project supervisors.

What academic support is available?

All students will have all the standard induction, advice and supervisory arrangements normally offered to students within SEMS. The school handbook will be provided (and made accessible at all times) to students, where all the channels of support will be outlined. These include the support channels within the school and also those available at College level.

Each module has a module coordinator, whose role is to ensure that the module runs smoothly, and that an appropriate level of information is provided to students of the module.

Project-work is carried out under the guidance of a specific academic member of staff, whose role includes the provision of academic and technical guidance, as well as monitoring your progress throughout the project.

Programme-specific rules and facts

NA

Specific support for disabled students

All students will have all the standard induction, advice and supervisory arrangements normally offered to students within SEMS. The school handbook will be provided (and made accessible at all times) to students, where all the channels of support will be outlined. These include the support channels within the school and also those available at College level.

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Links with employers, placement opportunities and transferable skills

SEMS enjoys a wealth of collaborative links with like-minded research centres across the world, in the USA, Europe, and Asia, and a regular flow of international research visitors contribute to the lively and cosmopolitan atmosphere. In addition, if you are viewing the (post)graduate courses in the college then additional information such as the individual course lecture notes are made available as well as previous years' examinations papers, and other useful resources like an extensive database of potential employers that have expressed an interest in employing our postgraduates in the past.

The staff involved in SEMS have strong links and research collaboration with industrial partners. MSc degree offers a high-level of training in computational engineering, with coverage of all the major areas to an advanced level. Graduates of this MSc programme generally have significantly more experience in computational engineering than would be the case for graduates of the corresponding BEng degree, and have experience of undertaking an extended research project. SEMS graduates can therefore be expected to possess a wider range of practical skills, and a greater ability to undertake independent research studies. The degree is therefore particularly suitable for those seeking to pursue a career as a professional design, manufacturing and research in computational engineering.

Graduates of SEMS degree courses are generally recognised by employers as having good technical and transferable skills: including skills in theoretical/numerical analysis, experiments, application of commercial software, problem solving, communication, IT and computation, independent research, and time management.

Programme Specification Approval

Person completing Programme Specification:	Dr. Jens-Dominik Mueller
Person responsible for management of programme:	Dr. Jens-Dominik Mueller
Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:	
Date Programme Specification approved by Taught Programmes Board:	