PROGRAMME SPECIFICATION (V3)

Degrees:

Programme Title	Final Award	duration of study/ years	Programme codes	Level
Computational Engineering	MSc	1	SITS- PSCEG UCAS-H131	7

Ownership	
Awarding institution:	Queen Mary University of London
Teaching institution	Queen Mary University of London
Academic Department(s) involved in programme delivery	School of Engineering and Materials Science
Main location(s) of study	Mile End Road, London
External references	
QAA Benchmark Group	Engineering
External Accreditor (if applicable)	Institution of Mechanical Engineers
Accreditation received	2018
Accreditation renewal	2022 pending (IMechE and RAeS)

Specification Details	
Programme Lead	Dr Jens-Dominik Mueller
Student cohorts covered by specification	2022 entry
Date of introduction of programme	September 2019
Date of programme specification / amendment	15/05/2022
Approval by School	Jan 2022
Approval by Taught Programmes Board	Dec 2019

1. Programme Overview

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 MSc degree in Computational Engineering is a 1 calendar year programme that is part of a suite of programmes offered in Engineering at Queen Mary University of London. MSc programmes are aimed at students who already and have an in depth knowledge of an area of Science and Engineering, and who wish to specialise further in an area of Computational Engineering.

The Computational Engineering degree programmes at QMUL are delivered by a large number of specialist academic staff, who, in addition to their teaching, are involved in internationally recognised research in a wide range of topics, including:
- Energy generation and conversion, including alternative and sustainable sources
- Heat transfer and fluid mechanics
- Computational engineering, both solids and fluids
- Control engineering
- Robotics
- Materials science, including structural and functional materials

The programme structure is designed to appeal to students with engineering, sciences or mathematics backgrounds, and is modular in format. You will take modules that will align with your background, your choice of specialisation area and your project topic. 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.

A 90 credit research project is to be undertaken using our research activities and our state of the art facilities. This allows enables a strong focus on the project research. 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 materials synthesis and characterisation labs.

The programme aims to prepare specialists with advanced skills in computational modelling, numerical and experimental techniques. 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. Upon completing this programme you will be able to perform design and analysis of Computational Engineering systems in your chosen area and to develop novel computational and technology products for Engineering industries.

In particular the programme has the following aims.
- Teaching advanced computational and analytical techniques applicable to general Engineering systems in order to provide an advanced base of knowledge and skills
- Teaching advanced computational techniques applicable to modelling and simulation of Engineering systems.

- Teaching modern design procedures used by the leading Engineering research and development units.
- Enabling students to participate in advanced research and industrial developments in Computational Engineering systems.

The program provides advanced training in the core computational methods for structures (CMS), fluids (CFD).

2. Learning outcomes for the programme

In this degree programme we place strong emphasis not only on the technical content of our modules, such as mechanics, thermodynamics and design, but also on cross disciplinary skills vital for an engineer to be effective in the work place. We embed these skills in the technical modules on the programme, to ensure that the technical knowledge and understanding works as you progress through your degree, and also to allow you to graduate with skills you can apply to a range of future careers.

Students who complete this programme will be trained to work in a wide range of industries that develop, design, and maintain Mechanical Engineering 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.

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

2.2 Discipline specific
- Use a range of scientific software and computational tools for solid/fluid mechanics analysis and optimisation
- Carry out an individual research project in computational engineering, including the ability to assimilate published knowledge and advance a subject area through research.
- Analyse, evaluate and interpret the results of numerical analyses and research results. Prepare scientific/technical reports of an appropriate professional standard.
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2.3 Attributes
- Engage critically with engineering knowledge and design principles.
- Be able to assess the relevance, importance and reliability of the ideas of others..
- Recognise the relevance, importance and reliability of the ideas of others.
- Develop research capacity and Information expertise.

3 Learning and teaching approaches

Teaching methods are tailor-made to suit the size of classes and the nature of the subject. Each module has a combination of methods including lectures, tutorials, laboratory sessions, industrial visits, workshops and group work. QMUL degrees combine face to face teaching and practical experiences with supported and structured on-line learning. Our virtual learning

platform is referred to as QMplus. Through this platform you will be able to find details about your modules, assessments, timetables and other activities.

Projects throughout the programme are designed for you to exercise independent thinking, research and problem solving skills. Group work enhances your communication, organisational as well as technical skills.

3.1   Employers Links
The school has an active Industrial Liaison forum (ILF). This forum has a direct impact on the programmes by encouraging employers to sponsor and support the students and to provide real design case studies to engage the students throughout the curriculum. Recent case studies that have been taught and assessed were delivered by Bridgestone, DePuys, Baxter, Artis, Corus, BAe, DSTL, Rolls Royce.

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.

The ILF meets twice a year. The event in October runs in parallel with the SEMS prize day where companies award prizes to more than 30 of our best students. During the October event the projects that you will tackle in the academic year are planned and the second event in March is designed to help evaluate and review the projects.

3.2   Assessment methods
You can expect a variety of different types of assessment methods:

Written assessment
- Examinations
- Progress tests
- Online assignments and quizzes
- Report and other writing
- Peer assessment

Practical assessment
- Laboratory/workshop practicals
- Design work
- Programming tests
- CAD & simulation tool tests

Oral assessment
- Oral presentations
- Poster presentations
- Group presentations
- Design presentations

Assessments allow you to demonstrate that you have met the intended learning outcomes for each module and contribute towards your achievement of the programme learning outcomes. There are summative (formal) assessments during and/or at the end of each module and well as ongoing formative (informal – no marks) through the degree. Examinations are intended to assess understanding rather than recall. Group assessments may incorporate peer marking.

Assessments operate in accordance with QMUL Regulations and established procedures. Feedback is provided through a number of formats, including:
- Oral (e.g. face to face during or after face-to-face sessions, video)
- Personal (e.g. discussion with staff)
- Interactive (e.g. Team Based Learning, peer-to-peer, online quizzes)

- Written (e.g. solutions, model answers, comments on work)

You will receive feedback on intermediate, developmental assessments such as project plan and progress reports and on coursework assessments. This feedback may be summarised for the whole cohort or be directed towards your work individually.

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

Feedback is intended to help you learn and you are encouraged to engage with it, reflect upon it and discuss it with your module organiser. Feedback will be provided on coursework and practical assessments within an appropriate time. Feedback on examination performance is available upon request from the module leader and overall class performance feedback on a question-by-question basis may also be provided.

QMUL's Policy on Assessment and Feedback and guidance on issuing provisional marks to students is available at: http://www.arcs.qmul.ac.uk/media/arcs/policyzone/Code-of-Practice-on-Assessment-and-Feedback_amended-2016.01.18.pdf

3.3 Support of students

We aim to support all students throughout their time with us. We encourage students to develop independently but this does not mean that you need to be alone. We know that support and encouragement from staff and fellow students is very important throughout your degree.

The Student Support Officer for SEMS is the first contact for any personal support; they can be contacted by email: sems-office@qmul.ac.uk with any questions or to arrange an appointment.

3.3.1 Academic Advisor arrangements

Your Academic Advisor will be your project supervisor.

3.3.2 Central support services

Disability and Dyslexia Service

QMUL 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 QMUL students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites. You 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
- 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

Advice and Counselling

QMUL offers a wide range of advice, guidance and self-help material. These free and confidential professional services are available to all students. Details can be found at:

https://www.welfare.qmul.ac.uk/student-advice-guides/

3.4 Interruption of Study

The University's Policy on a student's interruption of study is available at:

http://www.arcs.qmul.ac.uk/media/arcs/policyzone/academic/Interruption-of-Study-Policy-(June-2020).pdf

4   Programme structure

45 credits of taught modules will be taught in the first semester from September until December plus an additional 15 credits of taught material associated with the research project. A further 45 credits of taught modules will be taught in the second semester from January until April. All taught module examinations will be in the standard examination periods during January and May. The 90 credit Research Engineering project will be completed over 3 semesters.

The modules making up the programme are presented in the table below. Elective modules can be chosen from a range of modules. The student can either focus on an application area, choosing advanced engineering modules from the area of specialisation, or can focus on advanced skills in generic computational methods.

module	semester	title		credit
DENM100	A,B,C	Extended Research Project	core	90
DENM004	A	Computational Engineering	compulsory	15
EMS726P	A	Engineering Design Optimisation and Decision Making	compulsory	15
1 from:				
EMS703P	A	Introduction to Systems Engineering	elective	15
EMS702P	A	Statistical Thinking and Applied Machine Learning	elective	15
DENM001	A	Advanced Flight Control and Simulation of Aerospace Vehicles	elective	15
DENM035	A	Renewable Energy Sources	elective	15
DENM208	A	Advanced Heat Transfer and Fluid Mechanics	elective	15
EMS725P	A	Advanced mechanical modelling of materials	elective	15
DENM011	A	Robotics	elective	15
DENM010	B	Computational Fluid Dynamics	compulsory	15
2 from:				
EMS704P	B	Simulation and Model Based Systems Engineering	elective	15
DENM022	B	Advanced Gas Turbines	elective	15
EMS707P	B	Digital Signal Acquisition & Processing	elective	15
DENM032	B	Aeroelasticity	elective	15
MTH739N	B	Topics in Scientific Computing		15
DENM021	B	Advanced Combustion in Automotive Engines	elective	15

The credit load for elective modules are to be balanced across semesters.

Note: The modules, structure and assessments presented in this Programme Specification are correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You will be consulted and notified in a timely manner of any changes to this document.

5   Progression and Classification

The MSc follows QMUL's Academic Regulations which can be found at: https://arcs.qmul.ac.uk/policy/. However, please note that to receive an accredited degree programme, students must meet the Engineering Council's regulations which are outlined below. If a student does not meet the EngC requirements below but meets Queen Mary's award requirements, they will graduate with a different degree programme title to distinguish that the programme is not accredited.

To be eligible for an EngC-accredited MSc masters award, a student must meet all of the following requirements:
i. take 180 credits, including a minimum 150 credits at level 7. Any credits below level 7 must be at levels 5 or 6; a maximum 15 may be taken at level 5.
ii. pass a minimum 165 credits where the mark in any failed module is at least 40%.
iii. achieve a Classification Mark of 50.0 or higher.

5.2 Exit Awards

An exit award is an award at a lower level than that for which a student initially registered. An exit award may be recommended where a student meets the requirements for the lower level award and where the student has either withdrawn or been deregistered. Exit awards for the postgraduate programmes have the following hierarchy. A student will be awarded the highest linked award for which they meet all requirements: i Master of Science (MSc). ii Postgraduate Diploma (PgDip). iii Postgraduate Certificate (PgCert).

6 Entry requirements

Students will be admitted according to the entry requirements found at:

https://www.qmul.ac.uk/postgraduate/taught/coursefinder/courses/advanced-mechanical-engineering-msc/

7 Quality assurance

7.1 Student-Staff Liaison Committee (SSLC) meetings

The School has a Student-Staff Liaison Committee and students on this programme are represented on this committee. The committee meets twice during each semester and is made up of the following members:
- Director of Student Experience (Chair)
- Student Support Officer (Secretary)
- Directors of the relevant programmes
- At least one student representing the relevant programmes

The elections for the undergraduate representatives are organised through the Student Union. SSLC agendas and minutes are found on the SEMS QMplus landing page

(https://qmplus.qmul.ac.uk/course/view.php?id=13091). Relevant items on the minutes are referred to the appropriate School committees for consideration and feedback.

7.2 Evaluating and improving the quality and standards of teaching and learning
We assess our provision of teaching by:
- Module review by means of student feedback questionnaires and course organisers' reports.
- Annual staff appraisal.
- Peer observation of teaching.
- External examiners' reports.
- Periodic Internal Review by the College involving external panel members.
- Periodic Institutional Audit of the College by the Quality Assurance Agency.

The Committees within SEMS that have responsibility for monitoring and evaluating quality and standards are
- Education Committee
- Education Coordination Group
- Student Experience Committee
- Academic Standards Committee
- Teaching Development and Scholarship Committee
- Student-Staff Liaison Committee
- Subject Examination Boards – meet in in January, June and September to confirm marks and prizes, and to consider progression and awards
- Degree Examination Boards – meet in July to confirm progression and awards
- Science and Engineering Faculty Board
- University Quality Enhancement Committee.

The ways we receive student feedback on the quality of teaching and your learning experience are:
- Annual National Student Survey
- Student-Staff Liaison Committee
- Student feedback questionnaire evaluation
- Student forums on the School's website, including module and programme specific forums as well as ones covering more general topics
- Discussions with Academic Advisors.

7.3 Staff development
Our staff are continuously engaging with professional development activities, including courses and workshops related to teaching and learning.

8   Supporting Information
QMUL's Academic Regulations, Assessment Handbook and Admission policies can be found at:
>   https://arcs.qmul.ac.uk/policy/

QMUL is regulated by the Office for Students (OfS) www.officeforstudents.org.uk/advice-and-guidance/the-register/

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This

programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.