University of the West of England
BRISTOL

ACADEMIC SERVICES

PROGRAMME SPECIFICATION

Part 1: Basic Data		
Awarding Institution	University of the West of England	
Teaching Institution	University of the West of England	
Delivery Location	UWE, Frenchay Campus.	
Faculty responsible for programme	Faculty of Environment and Technology	
Department responsible for programme	Engineering Design and Mathematics	
Modular Scheme Title		
Professional Statutory or Regulatory Body Links	IMechE	
Highest Award Title	MSc Mechanical Engineering	
Default Award Title		
Fall-back Award Title		
Interim Award Titles	PG Diploma Mechanical Engineering PG Certificate Mechanical Engineering	
UWE Progression Route		
Mode(s) of Delivery	FT / PT	
Codes	**UCAS:**	**JACS:**
	ISIS2: H30B12	**HESA:**
Relevant QAA Subject Benchmark Statements	Engineering	
CAP Approval Date	June 2016 v1.3, Jan 2017 v2	
Valid from	September 2013	
Revised version valid from:	September 2017	
Valid until Date	September 2019	
Version	2	

Part 2: Educational Aims of the Programme
The aim of the Faculty's MSc programmes is to respond to the need for effective engineering practitioners by offering programmes that are an intellectually challenging mix of taught engineering science and experiential learning. The practitioner approach is intended to produce engineers with a strong orientation towards problem solving, underpinned by theoretical knowledge.

Part 2: Educational Aims of the Programme

The aim of the Mechanical Engineering MSc programme is to produce graduates with a broad understanding of mechanical analysis and design, combined with awareness of engineering practice, information technology, project management and business issues. The MSc course is distinguished by a greater emphasis upon critical appraisal of existing ideas and practice, original thought and creative ability.

This programme will produce graduates with a wide range of expertise relevant to industry in general and in particular industries related to mechanical design, operations and manufacture. The programme covers a broad range of advanced engineering topics including modelling and simulation of mechanical systems, computer vision and modern control, analysis of structural integrity and fluid system design, as well as project management both in groups and individually. In addition, being an accredited Masters level qualification, graduates will obtain the necessary educational qualifications to become Chartered Engineers through the IMechE.

The educational aims of the faculty's taught postgraduate programmes are:

- to provide an intellectual experience of advanced study, underpinned by staff expertise, research and experience;
- to enable the student to further and deepen his/her knowledge, understanding and analytical abilities in a stimulating and challenging academic environment;
- to prepare the student for further professional development in his/her chosen field;
- to develop the student's ability to conduct research in his/her chosen field;
- to offer postgraduate opportunities for part-time students in employment.

After completion of this programme, students should be able to:

- Apply established and novel mechanical analysis concepts to the solution of engineering problems, involving design, simulation and modelling.
- Simulate mechanical engineering systems so as to be able to judge the efficacy and implications of design proposals.
- Make considered judgements and decisions on complex engineering issues in which not all facts and consequences are accurately known;
- Be able to evaluate the importance of innovation and critically assess the key of operations management strategies.

Programme requirements for the purposes of the Higher Education Achievement Record (HEAR)

Not applicable

Part 3: Learning Outcomes of the Programme

A Knowledge and Understanding

A Knowledge and understanding of	**Teaching/learning methods and strategies:**
1. The principles governing the behaviour of mechanical components and systems. 2. The properties, characteristics and selection of materials used in mechanical components and systems. 3. Engineering science and technology with	Acquisition of 1 to 5 is through a combination of formal lectures, tutorials, laboratory work, guided project work, group assignments, independent projects and case studies. The programme of study is designed to enhance basic knowledge and understanding of the technologies underpinning engineering, design and

Part 3: Learning Outcomes of the Programme	
particular emphasis on areas related to mechanical systems. 4. The principles and practice of operations management. 5. The complexity of large-scale engineering systems and projects, with particular emphasis upon mechanical systems.	product development through a range of modules. This knowledge is integrated through group design and project work. Advanced tools and technologies are used and the programme as a whole is integrated through the MSc Individual Research Project. Throughout the student is encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject. Students on the MSc. programme are required to demonstrate in-depth understanding and analysis of technical topics, and to carry out a comprehensive literature review in their group design and project work.
	Assessment: Testing of the knowledge base is through assessed course work, through tasks undertaken under examination conditions, through oral presentations and assessed practical work done in various laboratories.
B Intellectual Skills	
Intellectual Skills 1. The ability to produce solutions to problems through the application of engineering knowledge and understanding. 2. Be able to use scientific principles in the modelling and analysis of engineering systems, processes and products. 3. The ability to select and apply appropriate methods of modelling and analysing relevant problems. 4. The ability to understand issues relating to innovation and operations management. 5. A professional attitude to the responsibilities of engineering practitioners. 6. The ability to use independent thinking and analysis in the development of engineering solutions. 7. Critically review available literature on topics related to engineering.	**Teaching/learning methods and strategies:** Students are required to bring together knowledge and skills acquired in several modules and hence determine new ways of working. As the student progresses, the need to synthesise ever-greater volumes of information and approaches into a coherent approach is developed and consequently so is their critical thinking. Students will be guided through small-scale problems to the design and analysis of larger scale systems. With this comes the need to evaluate alternative methods and designs and to balance conflicting objectives. Students will be given specific application examples and will develop an appreciation of problem contexts as well as striking the right balance when facing conflicting objectives. Work at level M requires independent thinking, information gathering and analysis. This is delivered through a combination of specialist taught modules plus group and individual project work.
	Assessment: The development of engineering solutions requires demonstration of a wide range of intellectual skills, covering analysis, evaluation and problem solving. These skills are assessed through a combination of

Part 3: Learning Outcomes of the Programme	
	coursework assessments, projects and examinations.
C Subject, Professional and Practical Skills	
Subject, Professional and Practical Skills 1. Use relevant design, test and measurement equipment. 2. Use experimental methods in the laboratory relating to engineering design and test. 3. Demonstrate practical testing of engineering ideas through laboratory work or simulation with technical analysis and critical evaluation of results. 4. Use a wide range of computing and information technology systems. 5. Demonstrate the ability to apply engineering techniques taking account of industrial and commercial constraints. 6. Execute and manage multi-disciplinary projects.	**Teaching/learning methods and strategies:** Throughout the programme, the skills listed are developed through a combination of theoretical discussion, practical laboratory based work, classroom-based tutorial exercises and directed self-study. The general teaching/learning method is to impart these practical/professional skills by a process of moving from an overview of what is required to a specific application of an individual skill at a higher level. Students on this award will integrate with students on the Faculty's MEng award for Group Design work. This will give a multi-disciplinary theme to the work and students will be required to communicate and cooperate with group members from other engineering disciplines. **Assessment:** The possession of these skills is demonstrated by the development of practical laboratory work, coursework, presentations and examinations. The practical nature of the skills to be acquired means that some are specifically addressed by particular modules, whilst the more generic skills are assessed across a range of modules.
D Transferable Skills and other attributes	
Transferable Skills and other attributes 1. Communication skills: to communicate orally or in writing, including, for instance, the results of technical investigation, to peers and/or to "problem owners".	**Teaching/learning methods and strategies:** Developed through a variety of methods and strategies including the following: • Students participate in electronic conferences, workshops, and group work sessions. • Students participate in discussion tutorials. • Students present research topic findings in tutorials. • Students participate in individual tutorials.
2. Self-management skills: to manage one's own time; to meet deadlines; to work with others having gained insights into the problems of team-based system development.	Developed through a verity of methods and strategies including the following: • Students conduct self-managed practical work. • Students participate in practically-oriented tutorial laboratory sessions. • Students work through practical work sheets in teams. • Students practice design and analysis.

Part 3: Learning Outcomes of the Programme	
3. IT skills in context: to use software in the context of problem-solving investigation and to interpret findings.	Developed widely throughout the programme.
4. Problem formulation: to express problems in appropriate notations.	Developed through a variety of methods and strategies including the following: • Students develop problem solving algorithms • Students practice design and simulation • Students investigate designs of larger systems
5. Progression to independent learning: to gain experience of, and to develop skills in, learning independently of structured class work. For example, to develop the ability to use online facilities to further self-study.	Developed through a variety of methods and strategies including the following: • Students practice problem solving to extend their skills • Students research relevant topics • Students are encouraged to use online facilities to support research into relevant topics
6. Comprehension of professional literature: to read and to use literature sources appropriate to the discipline to support learning activities.	Developed through a variety of methods and strategies including the following: • Students access online material • Students carry out a literature review
7. Working with others: to be able to work as a member of a team; to be aware of the benefits and problems that teamwork can bring.	Developed through a variety of methods and strategies including the following: • Students work as part of a team on the group design project.
	Assessment: These skills are demonstrated in a variety of contexts including • examination • poster presentation • individual and group projects • practical assignments • portfolio of exercises In addition, skill 2 is assessed by both peers and tutors.

Part 4: Student Learning and Student Support

Teaching and learning strategies to enable learning outcomes to be achieved and demonstrated

Contact time as part of this programme encompasses a range of face-to-face activities as described below. In addition, a range of other learning activities are embedded within the programme which, together with the contact time, will enable learning outcomes to be achieved and demonstrated.

On the MSc in Mechanical Engineering programme, teaching is a mix of scheduled learning and independent learning and project-based learning.

Part 4: Student Learning and Student Support

Scheduled learning includes lectures, tutorials, project supervision, demonstration, practical classes and workshops; and field work. Scheduled sessions may vary slightly depending on the module choices made.

Independent learning includes hours engaged with essential reading, case study preparation, assignment preparation and completion etc.

Project based learning: Dissertation work may be carried out at the University or at a company. University based dissertation projects will be carried out under the supervision of a member of the academic team and in the case of a company placement project, there will be an additional industrial supervisor. For the latter case, student time is to be split between work at UWE and work in industry.

Class Activities
The mode of delivery of a module is determined by its Module Leader, and typically involves a combination of one or more lectures, tutorials, laboratory classes, group activities and individual project work. Students on this award will integrate with students on the MEng programme for group design work. This will entail weekly meetings and discussions to analyse design proposals and develop solutions to a multi-disciplinary engineering project. We have extensive experience of operating this mode of project with our existing MEng students. Full and part-time students have successfully worked together to produce comprehensive design solutions encompassing considerable technical depth and breadth.

Academic Support
Academic advice and support is the responsibility of the staff delivering the module in question. Staff are expected to be available outside normal timetabled hours, either by appointment or during published "surgery" hours, in order to offer advice and guidance on matters relating to the material being taught and on its assessment.

Pastoral Care
The faculty offers pastoral care through its Student Advisers who provide comprehensive, full-time student support on a range of issues including funding, academic regulations, personal and health issues. The service operates on a drop-in basis or by appointment.

Progression to Independent Study
Many modules require students to carry out independent study, such as research for projects and assignments, and a full range of facilities are available at all sites to help students with these. The philosophy is accordingly to offer students both guided support and opportunities for independent study. Guided support, mainly in the form of timetabled sessions, takes the form of lectures, tutorials, seminars and practical laboratory sessions. Students are expected to attend all sessions on their timetable.

The progression to independent study will also be assisted by the nature of the support offered in individual modules. Typically, module leaders will provide a plan for the module indicating the activities to be carried out and the forms of learning to be undertaken during the delivery of the module, with a view to encouraging students to plan ahead and to take responsibility for managing their time and resources.

Computing Facilities
The Faculty offers a specialised computing facility alongside the general University provision. The specialist laboratories are equipped with the specific software; including Software Design

Part 4: Student Learning and Student Support

Tools development environment, CAD, finite element analysis, mathematics and statistics packages to support the taught program. The specialist Computing laboratories are designed to target the discipline taught in that area.

One of the most popular areas within the Faculty are the open access laboratories which provides 24 hour opening and gives students the opportunity to access machines at all times during opening hours. This is a mixed environment consisting of PCs and Unix workstations.

Due to the extensive computing facility provided within the Faculty, and the specialist nature of this facility, the need for user support is necessary. The Faculty provides a user support Helpdesk, staffed 8am-8pm every week day.

Access to Specialist Facilities
We have very extensive Mechanical Engineering laboratories at UWE; ranging from industrial robotics and mechatronics to state of the art rapid prototyping and modelling, including advanced workstations for computational fluid dynamics and kinematic modelling/simulation. These laboratories were initially developed for our undergraduate programmes in Mechanical Engineering and, more recently, updated and expanded to meet the needs of students on MEng programmes. Although these laboratories are in regular and frequent use by undergraduate students, the period during which MSc projects are being undertaken coincides with the period when UG students are making little or no use of laboratory facilities. Consequently, there is more than adequate capacity to facilitate access for MSc students

Description of any Distinctive Features

Design and Engineering Lab Facilities
Students on Engineering programmes can access a suite specialist laboratories. These include Structures, Material Science, Dynamics, Thermofluids, Aero (with sub sonic and supersonic wind tunnels and a programmable flight simulator with hydraulic motion platform), plus manufacturing workshops including CNC machines, laser cutting and rapid prototyping.

Students have 24/7 access to industry standard Computational Engineering software such as Ansys-CFX for Computational Fluid Dynamics and Abaqus for Mechanics of Composites.

Technology Enhanced Learning
Staff in the department are keen adopters of technology to support and enhance student learning. This may include computer based e-assessment, so that students can take regular short tests with automated computer generated feedback. In addition, recordings of some lectures (audio and video) are made available after classes via the university's Virtual Learning Environment.

Mathematics Support
EspressoMaths: provides drop-in one-to-one tuition each day in social learning spaces and a web-site that provides a portal to a variety of on-line resources in mathematics and statistics.

Part 5: Assessment

Approved to University Regulations and Procedures

Part 6: Programme Structure
This structure diagram demonstrates the student journey from Entry through to Graduation for a typical **full time student**, including: level and credit requirements, interim award requirements module diet, including compulsory and optional modules

ENTRY

Year	Compulsory Modules	Optional Modules	Interim Awards
1	UFMFXC-15-M: Masters Group Project UMMC9U-15-M Innovations in Operations Management UFMFTF-60-M Dissertation (Masters)	Students choose 90 credits (no more than 60 credits in a teaching block) UFMFRC-30-M Computer Vision and Modern Control UFMENU-15-M Design of Fluid Systems UFMEBP-15-M Structural Integrity in Design UFMFCC-15-M Industrial Applications of Vision and Automation UFME7K-15-M Intelligent and Adaptive Systems UFMFVL-15-M Mechanics of Composites UFMFWL-15-M Computational Fluid Dynamics UFMEEC-15-M Concurrent Engineering and Design for Manufacture UFMFSL-13-3 Integrated Electro-Mechanical Systems	**PG Cert Mechanical Engineering** Minimum 60 credits. **PG Diploma Mechanical Engineering** Minimum 120 credits excluding the dissertation. **Highest award:** **MSc Mechanical Engineering** (180 M level credits)

GRADUATION

Part time: The following structure diagram demonstrates the student journey from Entry through to Graduation for a typical **part time student.**

ENTRY

	Compulsory Modules	Optional Modules	Interim Awards
Year 1.1	*Students must take at least one, or both compulsory module(s) as below*: UFMFXC-15-M Masters Group Project UMMC9U-15-M Innovations in Operations Management	Students choose 90 credits (no more than 60 credits in a teaching block) UFMFRC-30-M Computer Vision and Modern Control UFMENU-15-M Design of Fluid Systems UFMEBP-15-M Structural Integrity in Design UFMFCC-15-M Industrial Applications of Vision and Automation UFME7K-15-M Intelligent and Adaptive Systems UFMFVL-15-M Mechanics of Composites UFMFWL-15-M Computational Fluid Dynamics UFMEES-15-M Concurrent Engineering and Design for Manufacture UFMFSL-13-3 Integrated Electro-Mechanical Systems	**PG Cert Mechanical Engineering** minimum 60 credits.
Year 1.2	UFMFTF-60-M Dissertation (Masters) *Students must take the remaining compulsory module (if not completed in Year 1.1):* EITHER UFMFXC-15-M Masters Group Project OR UMMC9U-15-M Innovations in Operations Management		**PG Diploma Mechanical Engineering** minimum 120 credits excluding the dissertation. **Highest award:** **MSc Mechanical Engineering** (180 M level credits)

GRADUATION

Part 7: Entry Requirements

In addition to the University's general requirements for entry to a postgraduate programme, entry requirements for the award require either a UK honours degree of 2:1 or above in Mechanical Engineering (or closely related subject) or an honours degree of 2:2 supplemented with three years relevant industrial experience. Applicants with first degrees in other disciplines will be considered if they have relevant professional experience and an in-depth understanding of:

- Degree level engineering mathematics
- Degree level dynamics and stress analysis
- Degree level fluid- and thermodynamics.

Part 8: Reference Points and Benchmarks

Description of ***how*** the following reference points and benchmarks have been used in the design of the programme:

This programme has been prepared with reference to a number of external benchmarks, including the QAA Subject Benchmark Statement for Engineering, the QAA Framework for HE Qualifications and the university's Learning & Teaching Strategy.

The QAA Framework for HE Qualifications defines a programme at masters level as: "at, or informed by, the forefront of an academic or professional discipline. Students will have shown originality in the application of knowledge, and they will understand how the boundaries of knowledge are advanced through research. They will be able to deal with complex issues both systematically and creatively, and they will show originality in tackling and solving problems".

The Subject Benchmark Statement for Engineering outlines a set of skills expected of a graduate in an engineering discipline (Section 4 of the Statement refers), while noting that they should be interpreted in the context of the particular engineering discipline which is being studied. These skills map closely to many of the skills contained in the learning outcomes for the proposed programme of study. The MSc in Mechanical Engineering has been designed to enhance and develop these skills to postgraduate level. In particular this programme requires students to demonstrate skills at a postgraduate level relating to the specification, management and solution of engineering problems. There is also considerable emphasis on the analysis and design of engineering solutions at postgraduate level, and the ability to research and critically evaluate alternative proposals. Consequently, we believe that the MSc award will build on and enhance the skills in the Subject Benchmark Statement for Engineering.

Research

Staff in the Faculty of Environment and Technology are research and consultancy active. Some modules are based in the Bristol Robotics Laboratory which now includes our Machine Vision Lab and some of the academics teaching on the course are also members of the newly established Engineering Modelling and Simulation research group. Consequently the programme development, formal teaching and project work are underpinned and informed by current research. Staff contributing to the programme have an established record in supervising postgraduate research-based projects MSc, MRes and PhD level, and students may have the opportunity to carry out their projects working alongside research staff at post-doctorate level.

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 he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of individual modules can be found in module specifications, available on the University's website.