

# PROGRAMME SPECIFICATION

## Bachelor of Engineering with Honours in Mechanical and Manufacturing Engineering

<b>Awarding institution</b>	Liverpool John Moores University
<b>Teaching institution</b>	Liverpool John Moores University
<b>UCAS Code</b>	4S13
<b>JACS Code</b>	H300
<b>Programme Duration</b>	
<b>Language of Programme</b>	All LJMU programmes are delivered and assessed in English
<b>Subject benchmark statement</b>	Engineering Council UK Spec
<b>Programme accredited by</b>	
<b>Description of accreditation</b>	
<b>Validated target and alternative exit awards</b>	Bachelor of Engineering with Honours in Mechanical and Manufacturing Engineering  Bachelor of Engineering Honours (SW) in Mechanical and Manufacturing Engineering  Bachelor of Engineering in Mechanical and Manufacturing Engineering  Bachelor of Engineering (SW) in Mechanical and Manufacturing Engineering  Diploma of Higher Education in Mechanical and Manufacturing Engineering  Certificate of Higher Education in Mechanical and Manufacturing Engineering
<b>Programme Leader</b>	Christian Matthews

## Educational aims of the programme

The BEng. Honours programme in Mechanical and Manufacturing Engineering is designed to partially fulfil the educational requirements for Chartered Engineer status. It is designed to develop a high level of technical expertise together with the emotional intelligence to be able to practise successfully as a professional engineer in a modern interdisciplinary engineering environment. Graduate engineers are increasingly expected to take on important technical leadership and management responsibilities early in their careers and the knowledge and skills gained from this programme are designed to produce graduates who are able to make an immediate contribution to their employers organisations.

The programme aims to:

- Deliver the educational experience in which students can develop their knowledge of engineering science, core engineering principles, fundamental underpinning subjects such as mathematics and computation in addition to modern manufacturing techniques.
- Develop students confidence to analyse challenging technical problems and to further develop their core engineering knowledge and skills through the investigation and development of credible and robust solutions.
- Provide students with appropriate support and encouragement to develop the necessary skills such that they can study independently and take responsibility for their own learning and subsequent professional development.
- Provide engineering graduates with a range of highly relevant transferable skills such as team working, communication, management, problem solving, computing and technical computing.
- Provide a programme of study that fully meets the requirements of the Engineering Councils UK Standard for Professional Engineering Competence (UKSpec) and partially qualifies the successful graduate for the attainment of the Engineering Council Chartered Engineer status after completion of an appropriate period of

industrial experience.

- Produce graduates with a depth, breadth of knowledge and understanding of mechanical and manufacturing engineering, management and teamwork to enable them to rapidly assume technical leadership and management roles.

- Encourage students to fully engage with the World of Work programme, including World of Work Skills Certificate and, as a first step towards this, to complete Bronze (Self Awareness) Statement.

Additionally for sandwich students:

- Give students first-hand knowledge and experience of the practice of mechanical and manufacturing engineering in UK and European industry and the operation and internal structure of typical manufacturing engineering based companies.

The programme meets the requirements of the Engineering Councils 'UK Standard for Professional Engineering Competence' (UKSpec).

## Target award Learning Outcomes - Bachelor of Engineering with Honours

*A student successfully completing the programme of study will have acquired subject knowledge and understanding as well as skills and other attributes.*

### Knowledge and understanding

*A student who is eligible for this award will be able to:*

A1. The student must be able to demonstrate their knowledge and understanding of essential facts, concepts, theories and principles of their engineering discipline, and its underpinning science and mathematics. They must have an appreciation of the wider multidisciplinary engineering context and its underlying principles. They must appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgment.

A2. Demonstrate a knowledge and understanding of scientific principles and methodology necessary to underpin their education in mechanical and manufacturing engineering, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies.

A3. Illustrate a knowledge and understanding of mathematical principles necessary to underpin their education in mechanical and manufacturing engineering and related engineering disciplines and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems.

A4. Demonstrate an ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of mechanical and related engineering disciplines.

A5. Understand engineering principles and have the ability to apply them to analyse key engineering processes.

A6. Illustrate an ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.

A7. Demonstrate an ability to apply quantitative methods and computer software relevant to mechanical, manufacturing and related engineering disciplines to solve engineering problems

### Teaching, learning and assessment methods used to enable outcomes to be achieved and demonstrated

Acquisition of underpinning knowledge is achieved mainly through lectures and directed student-centred learning. Student-centred learning is used where appropriate resource material is available. Understanding is reinforced through case-studies.

### Assessment

Testing of the knowledge base is through a combination of unseen written examinations, coursework in the form of case-study reports and coursework assignment submissions.

## Skills and other attributes

### Intellectual Skills

*A student who is eligible for this award will be able to:*

B1. Students must be able to apply appropriate quantitative science and engineering tools to the analysis of problems. They must be able to demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs. They must be able to comprehend the broad picture and thus work with an appropriate level of detail.

B2. Demonstrate an understanding of and ability to apply a systems approach to engineering problems.

B3. Demonstrate a knowledge and understanding of the commercial and economic context of engineering processes.

B4. Illustrate a knowledge of management techniques which may be used to achieve engineering objectives within that context

B5. Understand the requirement for engineering activities to promote sustainable development.

B6. Demonstrate an awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues

B7. Understand the need for a high level of professional and ethical conduct in engineering.

### **Teaching, learning and assessment methods used to enable outcomes to be achieved and demonstrated**

The student must appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgment.

#### **Assessment**

Acquisition of Intellectual skills is achieved mainly through lectures and directed student-centred learning.

Student-centred learning is used where appropriate resource material is available. Understanding is reinforced through case-studies.

## **Professional practical skills**

*A student who is eligible for this award will be able to:*

C1. Students must possess practical engineering skills acquired through, for example, work carried out in laboratories and workshops; in industry through supervised work experience; in individual and group project work; in design work; and in the development and use of computer software in design, analysis and control. Evidence of group working and of participation in a major project is expected.

C2. Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues

C3. Understand customer and user needs and the importance of considerations such as aesthetics.

C4. Identify and manage cost drivers.

C5. Demonstrate creativity to establish innovative solutions.

C6. Illustrate creativity to establish innovative solutions.

C7. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal.

C8. Manage the design process and evaluate outcomes.

C9. Demonstrate a knowledge of the characteristics of particular equipment, processes or products.

C10. Develop engineering workshop and laboratory skills.

C11. Demonstrate an Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc.).

### **Teaching, learning and assessment methods used to enable outcomes to be achieved and demonstrated**

Engineering design, analysis and practical skills are taught almost exclusively by individual and group project work supported by a lecture programme appropriate to the demands of the project.

#### **Assessment**

Engineering design and practical skills are assessed by individual and group written design project reports, student presentations and presentations using computer graphics.

## **Transferable / key skills**

*A student who is eligible for this award will be able to:*

D1. The student must have developed transferable skills that will be of value in a wide range of situations. These are exemplified by the Qualifications and Curriculum Authority Higher Level Key Skills and include problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills. They also include planning self-learning and improving performance, as the foundation for lifelong learning/CPD.

D2. Understand the use of technical literature and other information sources.

D3. Demonstrate an awareness of nature of intellectual property and contractual issues.

D4. Demonstrate an understanding of appropriate codes of practice and industry standards.

D5. Illustrate an awareness of quality issues.

D6. Demonstrate an ability to work with technical uncertainty.

**Teaching, learning and assessment methods used to enable outcomes to be achieved and demonstrated**

The economic, Social and Environmental context of engineering operations is delivered by means of lectures and case studies. The use of appropriate case study material is an essential part of teaching in this area.

**Assessment**

Assessment is via a combination of unseen written examinations and coursework in the form of case-study reports.

**Programme structure - programme rules and modules**

**Programme rules**

Minimum pass mark is 40% for all modules at levels 4, 5 and 6

The marks from the second and third year assessments contribute to the final degree classification i.e.

25% of Level 5 marks and 75% of Level 6. All 120 credits at Level 5 and 6 are used in the calculation of the award mark.

In order to progress from Level 4 to Level 5 the prerequisites are:-

4115ENG Engineering Mathematics 1, 4111ENG Thermodynamics and Fluid Mechanics 1 and 4114ENG Applied Mechanics 1

And Level 5 to Level 6:-

5121ENG Engineering Mathematics 2, 5116ENG Thermodynamics and Fluid Mechanics 2 and 5115ENG Applied Mechanics 2

If students wish to transfer from the BEng Mechanical Engineering programme to the MEng route they must achieve an average mark of 60% at Level 5 or 60% at Level 6.

**Programme Variance**

The School has the following variance to University regulations:-

1.Units of 10 and 20 credits to be continued to be permitted on undergraduate programmes. Units of 30 credits to be permitted to replace 36 credit project modules.

2.The maximum allowed compensation is 20 credits (levels 4, 5, and 6).

3.No discounting of modules is permitted on any accredited programme. The calculation of degree classification is therefore based on the full 120 credits at Level 5 and Level 6 (BEng).

Level 6	Potential Awards on completion	Bachelor of Engineering with Honours
Core	Option	Award Requirements
6155ENG Engineering Project (30 credits) 6161ENG Materials Engineering (10 credits) 6165ENG Industrial Management (20 credits) 6170ENG Industrial Automation (20 credits) 6171ENG Manufacturing Operations	6156ENG Fluid Dynamics and Heat Transfer (10 credits) 6157ENG Thermodynamics (10 credits) 6158ENG Dynamics and Control (10 credits) 6159ENG Structural Integrity (10 credits) 6160ENG Mechanical Engineering	100 core credits at level 6 20 option credits at level 6

Management (20 credits)	Design 3 (20 credits) 6163ENG Engineering Analysis (20 credits)	
Level 5	Potential Awards on completion	
Core	Option	Award Requirements
5115ENG Applied Mechanics 2 (20 credits) 5116ENG Thermodynamics and Fluid Mechanics 2 (20 credits) 5117ENG Mechanical Engineering Design 2 (20 credits) 5118ENG Engineering Practice 2 (20 credits) 5119ENG Materials and Processes (10 credits) 5120ENG Control and Instrumentation (20 credits) 5121ENG Engineering Mathematics 2 (10 credits)		120 core credits at level 5 0 option credits at level 5
Level 4	Potential Awards on completion	
Core	Option	Award Requirements
4110ENG Engineering Practice 1 (20 credits) 4111ENG Thermodynamics and Fluid Mechanics 1 (20 credits) 4112ENG Materials and Manufacture (20 credits) 4113ENG Mechanical Engineering Design 1 (10 credits) 4114ENG Applied Mechanics 1 (20 credits) 4115ENG Engineering Mathematics 1 (20 credits) 4121ENG Electrical and Electronic Engineering (10 credits)		120 core credits at level 4 0 option credits at level 4

## Information about assessment regulations

All programmes leading to LJMU awards operate within the University's Academic Framework.  
<https://www.ljmu.ac.uk/about-us/public-information/academic-quality-and-regulations/academic-framework>

## Opportunities for work-related learning ( location and nature of activities)

Students are encouraged to undertake a year's industrial placement between Level 5 and 6. There is a further opportunity to undertake summer placements between academic years to gain valuable industrial experience. There are also opportunities to complete industrially based projects via individual engineering projects at Level 6.

This work experience will help develop understanding of the world of work environment suitable for the programme and increase a student's professional practical skills.

To pass the industrial placement:

- The University Tutor must award at least a pass grade.
- The Company Tutor must award at least a pass grade.
- The University Tutor must award at least a pass grade to the Professional Placement Report written by the student.

Further information about Graduate Skills can be found at:

<http://www.ljmu.ac.uk/worldofwork/123832.htm> (The World of Work Careers Centre website)

<http://www.ljmu.ac.uk/eaqs/128262.htm> (Regulations in Practice - Section 5 Work Related Learning and Additional

Information)

## Criteria for admission

### **A/AS Level**

Applicants should have or expect to obtain a total of 280 UCAS points. At A2-level, applicants should expect to gain at least 160 points from Mathematics and one of following; (Physics, Chemistry, Computing, Further Maths, Electronics or Engineering.

### **BTEC National Diploma**

BTEC Extended Diploma

Applicants should have or expect to obtain a total of 280 UCAS points (DMM), in an Engineering discipline with a Distinction grade in Further Mathematics unit.

BTEC Diploma / 90 Credit Diploma / Subsidiary Diploma /Certificate

To the value of 280 UCAS points when combined with other qualifications. Must be in an Engineering discipline.

A Distinction grade in the Further Mathematics unit is required.

### **Irish Leaving Certificate**

Applicants should have or expect to obtain a total of 280 UCAS overall including grade A2 in Higher level

Mathematics and grade A2 in another relevant subject at Higher level eg. Physics.

### **Scottish Higher**

Applicants should have or expect to obtain a total of 280 UCAS points. At higher-level or advanced higher-level,

applicants should expect to obtain at least two awards and gain at least 160 points, from Mathematics and one of the following; Physics, Chemistry, Computing, Further Maths, Electronics or Engineering.

### **International Baccalaureate**

Applicants should have or expect to obtain the equivalent of 280 UCAS points overall with 5 IB points in HL

Mathematics and 5 IB points in HL Physics.

### **Other**

Applicants should have five GCSE (or equivalent) passes of at least grade C including Mathematics and English (or IELTS 6.0).

### **Mature entry**

We welcome applications from highly motivated mature students with relevant experience but without the

necessary formal qualifications. All applications will be considered on an individual basis.

### **Overseas qualifications**

Applicants offering other awards will be considered on an individual basis in line with the agreed entry criteria.

## External Quality Benchmarks

All programmes leading to LJMU awards have been designed and approved in accordance with the UK Quality Code for Higher Education, including the Framework for Higher Education Qualifications in the UK (FHEQ) and subject benchmark statements where applicable.

The University is subject to periodic review of its quality and standards by the Quality Assurance Agency (QAA) Published review reports are available on the QAA website at [www.qaa.ac.uk](http://www.qaa.ac.uk)

Programmes which are professionally accredited are reviewed by professional, statutory and regulatory bodies (PSRBs) and such programmes must meet the competencies/standards of those PSRBs.

## Support for students and their learning

The University aims to provide students with access to appropriate and timely information, support and guidance to ensure that they are able to benefit fully from their time at LJMU. All students are assigned a Personal Tutor to provide academic support and when necessary signpost students to the appropriate University support services.

Students are able to access a range of professional services including:

- Advice on practical aspects of study and how to use these opportunities to support and enhance their personal and academic development. This includes support for placements and careers guidance.
- Student Advice and Wellbeing Services provide students with advice, support and information, particularly in the areas of: student funding and financial matters, disability, advice and support to international students, study support, accommodation, health, wellbeing and counselling.
- Students studying for an LJMU award at a partner organisation will have access to local support services

## **Methods for evaluating and improving the quality and standards of teaching and learning**

### **Student Feedback and Evaluation**

The University uses the results of student feedback from internal and external student surveys (such as module evaluations, the NSS and PTES), module evaluation questionnaires and meetings with student representatives to improve the quality of programmes.

### **Staff development**

The quality of teaching is assured through staff review and staff development in learning, teaching and assessment.

### **Internal Review**

All programmes are reviewed annually and periodically, informed by a range of data and feedback, to ensure quality and standards of programmes and to make improvements to programmes.

### **External Examining**

External examiners are appointed to programmes to assess whether:

- the University is maintaining the threshold academic standards set for awards in accordance with the FHEQ and applicable subject benchmark statements
- the assessment process measures student achievement rigorously and fairly against the intended outcomes of the programme(s) and is conducted in line with University policies and regulations
- the academic standards are comparable with those in other UK higher education institutions of which external examiners have experience
- the achievement of students are comparable with those in other UK higher education institutions of which the external examiners have experience

and to provide informative comment and recommendations on:

- good practice and innovation relating to learning, teaching and assessment observed by external examiners
- opportunities to enhance the quality of the learning opportunities provided to students

### **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 he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content, teaching, learning and assessment methods of each module can be found in module and programme guides.*