Programme Specification Document

Approved, 2022.02

Overview

Programme Code	32120-MG
Programme Title	Mechanical Engineering
Awarding Institution	Liverpool John Moores University
Programme Type	Integrated Masters
Language of Programme	All LJMU programmes are delivered and assessed in English
Programme Leader	Sean Malkeson
Link Tutor(s)	

Awards

Award Type	Award Description	Award Learning Outcomes
Target Award	Master of Engineering - MG	See Learning Outcomes Below
Recruitable Target	Master of Engineering (SW) - SMG	See Learning Outcomes Below
Alternative Exit	Diploma of Higher Education - DHE	Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study. Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles. Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed. Select and evaluate technical literature and other sources of information to address complex problems, Design solutions for complex problems that meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health & safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards. Apply an integrated or systems approach to the solution of complex problems. Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts. Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity. Use practical laboratory and workshop skills to investigate complex problems. Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights. Function effectively as an individual, and as a member or leader of a team. Communicate effectively on complex engineering matters with technical and non-technical audiences. Plan and record self learning and development as the foundation for lifelong learning/CPD.

Alternative Exit	Diploma in Higher Education (SW) - SDHE	Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study. Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles. Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed. Select and evaluate technical literature and other sources of information to address complex problems, Design solutions for complex problems that meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health & safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards. Apply an integrated or systems approach to the solution of complex problems. Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts. Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity. Use practical laboratory and workshop skills to investigate complex problems. Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights. Function effectively as an individual, and as a member or leader of a team. Communicate effectively on complex engineering matters with technical and non-technical audiences. Plan and record self learning and development as the foundation for lifelong learning/CPD.
Alternative Exit	Bachelor of Engineering with Honours - BGH	Students who obtain this award will have achieved most but not all of the programme learning outcomes of the equivalent Batchelors award with honours.
Alternative Exit	Certificate of Higher Education - CHE	Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of problems. Analyse problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles. Select and apply appropriate computational and analytical techniques to model engineering problems, recognising the limitations of the techniques employed. Design solutions for simple problems that meet some combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health & safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards Apply an integrated or systems approach to the solution of problems with multiple components. Appreciate how risk assessment is used to identify, evaluate and mitigate hazards associated with a particular activity. Use practical laboratory and workshop skills to investigate engineering problems. Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations. Communicate effectively on engineering matters with technical and non-technical audiences.
Alternative Exit	Bachelor of Engineering Honours (SW) - SBGH	Students who obtain this award will have achieved most but not all of the programme learning outcomes of the equivalent Batchelors award with honours.

Alternate Award Names	

External Benchmarks

Subject Benchmark Statement	UG-Engineering (2019)

Accreditation

Programme Accredited by

PSRB Name	Type of Accreditation	Valid From Date	Valid To Date	Additional Notes
Institution of Mechanical Engineers (IMechE)	Accredited by the Institution of Mechanical Engineers (IMechE) on behalf of the Engineering Council for the purposes of partially meeting the academic requirement for registration as a Chartered Engineer.			

Programme Offering(s)

Mode of Study, Mode of Delivery	Intake Month	Teaching Institution	Programme Length
Full-Time, Face to Face	September	LJMU Taught	4 Years
Sandwich Year Out, Face to Face	September	LJMU Taught	5 Years

Aims and Outcomes

Educational Aims of the Programme

The MEng programme in Mechanical Engineering is designed to fully meet 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 practice successfully as a professional engineer in a modern interdisciplinary engineering environment. Graduate engineers are increasingly expected to take on 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: - Develop graduates with transferable skills and professional traits above those associated with a BEng graduate that will allow students that complete the programme to hold technical roles within a range of mechanical engineering and associated industries. - Deliver the educational experience in which students can develop their knowledge of engineering science, core engineering principles and fundamental underpinning subjects such as mathematics and computation. - Develop graduates who have the confidence to analyse complex 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. - Develop engineering graduates with a keen sense of ethical responsibility who are aware of issues of sustainability, safety and security in whatever engineering role they are performing. They will recognise the importance of equality, diversity and inclusivity in the workplace, and in the engineered solutions that they provide. - Provide a programme of study that fully meets the requirements of the Engineering Councils UK Standard for Professional Engineering Competence (UKSpec) and qualifies the successful graduate for the attainment of the Engineering Council Chartered Engineer status after completion of an appropriate period of post-graduate industrial experience. - Produce graduates with an increased depth, breadth of knowledge and understanding of mechanical engineering, management and teamwork to enable them to rapidly assume technical leadership and management roles. - Encourage students to plan and record self learning and personal development as the foundation for lifelong learning/CPD. -For students undertaking a placement year the aim is to provide students with an extended period of work experience at an approved partner that will complement their programme of study at LJMU. This will give the students the opportunity to develop professional skills relevant to their programme of study, as well as attitude and behaviours necessary for employment in a diverse and changing environment. The programme is currently accredited by the Institution of Mechanical Engineers and meets the requirements of the Engineering Councils 'UK Standard for Professional Engineering Competence' (UKSpec). This version of the program has been updated to match the outcomes of the Engineering Council UK AHEP, 4th Edition, standards (December 2021).

Learning Outcomes

Code	Description
PLO1	Apply a comprehensive knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Much of the knowledge will be at the forefront of the particular subject of study and informed by a critical awareness of new developments and the wider context of engineering.
PLO2	Adopt a holistic and proportionate approach to the mitigation of security risks.
PLO3	Adopt an inclusive approach to engineering practice and recognise the responsibilities, benefits and importance of supporting equality, diversity and inclusion.
PLO4	Use practical laboratory and workshop skills to investigate complex problems.
PLO5	Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations.
PLO6	Discuss the role of quality management systems and continuous improvement in the context of complex problems.

Code	Description
PLO7	Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights.
PLO8	Function effectively as an individual, and as a member or leader of a team. Evaluate effectiveness of own and team performance.
PLO9	Communicate effectively on complex engineering matters with technical and non-technical audiences, evaluating the effectiveness of the methods used.
PLO10	Plan and record self learning and development as the foundation for lifelong learning/CPD.
PLO11	Formulate and analyse complex problems to reach substantiated conclusions. This will involve evaluating available data using first principles of mathematics, statistics, natural science and engineering principles, and using engineering judgment to work with information that may be uncertain or incomplete, discussing the limitations of the techniques employed.
PLO12	Select and apply appropriate computational and analytical techniques to model complex problems, discussing the limitations of the techniques employed.
PLO13	Select and critically evaluate technical literature and other sources of information to solve complex problems
PLO14	Design solutions for complex problems that evidence some originality and meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health & safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards.
PLO15	Apply an integrated or systems approach to the solution of complex problems.
PLO16	Evaluate the environmental and societal impact of solutions to complex problems (to include the entire life-cycle of a product or process) and minimise adverse impacts.
PLO17	Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct
PLO18	Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity.

Programme Structure

Programme Structure Description

The marks from level 5, 6 and 7 assessments contribute to the final degree classification i.e. 10% of Level 5 marks, 30% of Level 6 marks and 60% of Level 7 marks. At levels 4 and 5, all modules are core. At level 6, all students complete core modules (80 credits) and will select 40 credits of optional modules (20 credits in each semester). At level 7, all students complete core modules (80 credits) and will select 40 credits of optional modules (20 credits in each semester). Students have the option to undertake a placement year. The placement year, module 5111MECH, will follow Level 5 and students will be enrolled on a 600 credit honours sandwich programme. The Level 5 mean for the final award mark will be calculated based upon the 240 credits at Level 5. Students successfully completing the assessment of the placement year are eligible for a Sandwich award. Students not undertaking a placement year are registered on the non-sandwich version of the programme and will have the opportunity of an additional study year abroad following Level 5. Students will be enrolled on a 600 credit honours with study abroad programme. Of those 600 credits, 120 will be taken via a Level 5 study abroad module 5112MECH. The modules to be studied in the host institution must be agreed in advance. The Level 5 mean for the final award mark will be calculated based upon the 240 credits at Level 5.

Programme Structure - 480 credit points	
Level 4 - 120 credit points	
Level 4 Core - 120 credit points	CORE
[MODULE] 4301MECH Engineering Mathematics 1a Approved 2022.03 - 10 credit points	
[MODULE] 4302MECH Engineering Mathematics 1b Approved 2022.02 - 10 credit points	
[MODULE] 4303MECH Applied Mechanics 1 Approved 2022.01 - 20 credit points	
[MODULE] 4304MECH Thermodynamics and Fluid Mechanics 1 Approved 2022.01 - 20 credit points	
[MODULE] 4305MECH Materials Approved 2022.01 - 20 credit points	
[MODULE] 4306MECH Engineering Practice Approved 2022.01 - 20 credit points	
[MODULE] 4307MECH Mechatronics 1 Approved 2022.02 - 20 credit points	
Level 5 - 120 credit points	
Level 5 Core - 120 credit points	CORE
[MODULE] 5302MECH Engineering Mathematics 2 Approved 2022.02 - 20 credit points	
[MODULE] 5303MECH Materials and Processes Approved 2022.01 - 10 credit points	
[MODULE] 5304MECH Applied Mechanics 2 Approved 2022.01 - 20 credit points	
[MODULE] 5305MECH Thermodynamics and Fluid Mechanics 2 Approved 2022.01 - 20 credit points	
[MODULE] 5307MECH Engineering Design 2 Approved 2022.01 - 20 credit points	
[MODULE] 5308MECH Mechatronics 2 Approved 2022.01 - 20 credit points	
[MODULE] 5311MECH Modelling and Simulation Approved 2022.01 - 10 credit points	
Optional placement - 120 credit points	OPTIONAL
Placement Year - 120 credit points	OPTIONAL
[MODULE] 5111MECH Sandwich Year - Mechanical Engineering Approved 2022.01 - 120 credit points	
OR Study Abroad - 120 credit points	OPTIONAL
[MODULE] 5112MECH Study Year Abroad - Mechanical Engineering Approved 2022.01 - 120 credit points	
Level 6 - 120 credit points	
Level 6 Core - 80 credit points	CORE
[MODULE] 6301MECH Engineering Project Approved 2022.01 - 40 credit points	
[MODULE] 6303MECH Engineering Design 3 Approved 2022.01 - 20 credit points	

[MODULE] 6304MECH Industrial Management Approved 2022.01 - 20 credit points	
Level 6 Optional - 40 credit points	OPTIONAL
[MODULE] 6302MECH Finite Element Analysis Approved 2022.02 - 10 credit points	
[MODULE] 6308MECH Fluid Dynamics and Heat Transfer Approved 2022.01 - 10 credit points	
[MODULE] 6309MECH Thermodynamics Approved 2022.01 - 10 credit points	
[MODULE] 6310MECH Materials Engineering Approved 2022.01 - 10 credit points	
[MODULE] 6311MECH Structural Integrity Approved 2022.01 - 10 credit points	
[MODULE] 6312MECH Manufacturing Systems Approved 2022.02 - 10 credit points	
[MODULE] 6313MECH Dynamics and Control Approved 2022.01 - 10 credit points	
[MODULE] 6314MECH Computational Fluid Dynamics Approved 2022.01 - 10 credit points	
[MODULE] 6315MECH Sensors and Robotics Approved 2022.01 - 10 credit points	
Level 7 - 120 credit points	
Level 7 Core - 80 credit points	CORE
[MODULE] 7124MECH Operations Research Approved 2022.01 - 20 credit points	
[MODULE] 7300ENR Professional Practice Approved 2022.01 - 20 credit points	
[MODULE] 7301MECH Group Design Project Approved 2022.01 - 40 credit points	
Level 7 Optional - 40 credit points	OPTIONAL
[MODULE] 7307MECH Advanced Finite Element Analysis Approved 2022.01 - 10 credit points	
[MODULE] 7308MECH Conventional and Alternative Energy Systems Approved 2022.01 - 10 credit points	
[MODULE] 7309MECH Offshore Engineering Approved 2022.03 - 10 credit points	
[MODULE] 7310MECH Advanced Computational Fluid Dynamics Approved 2022.01 - 10 credit points	
[MODULE] 7311MECH Advanced Manufacturing Processes Approved 2022.01 - 10 credit points	
[MODULE] 7312MECH Structural Dynamics Approved 2022.01 - 10 credit points	
[MODULE] 7314MECH Advanced Materials Approved 2022.01 - 10 credit points	

Module specifications may be accessed at https://proformas.ljmu.ac.uk/Default.aspx

Approved variance from Academic Framework Regulations

Variance
A variance permits the use of more than 2, but not more than four, 10 credit modules at level 6. A variance permits the use of more than 2, but not more than four, 10 credit modules at level 7. Approved on October 6th 2021

Teaching, Learning and Assessment

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. 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. The students must appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement. Acquisition of Intellectual skills is achieved mainly through lectures and direct student-centred learning. Student-centred learning is used where appropriate resource material is available. Understanding is reinforced through case-studies. 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. Engineering design and practical skills are assessed by individual and group written design project reports, student presentations and presentations using computer graphics. 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 is via a combination of unseen written examinations and coursework in the form of case-study reports.

Opportunities for work related learning

Students are encouraged to undertake a year long industrial placement between Levels 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.

Entry Requirements

Type	Description
Other international requirements	Applicants offering other awards will be considered on an individual basis in line with the agreed entry criteria.
BTECs	BTEC Extended Diploma Applicants should have or expect to obtain a total of 128 UCAS points (DDM), in an Engineering discipline with a distinction grade in the Further Mathematics unit. Specific optional units must also be completed, please contact the Faculty of Engineering and Technology (FET) for more information BTEC Diploma / 90 Credit Diploma / Subsidiary Diploma /Certificate To the value of 128 UCAS points when combined with other qualifications. Must be in an Engineering discipline. A Distinction grade in the Further Mathematics unit is required.
International Baccalaureate	Applicants should have or expect to obtain the equivalent of 128 UCAS points (26 IB Diploma points) overall with 5 IB points in HL Mathematics and 5 IB points in HL Physics.
Alternative qualifications considered	Applicants should have five GCSE (or equivalent) passes of at least grade C, or grade 4, including Mathematics and English (or IELTS 6.0).
A levels	Applicants should have or expect to obtain a total of 128 UCAS points. At A2-level, applicants are expect to gain at least 80 points from Mathematics and one of following; (Physics, Chemistry, Computing, Further Maths, Electronics or Engineering).

Extra Entry Requirements