

PROGRAMME SPECIFICATION

Bachelor of Engineering with Honours in Control and Automation Engineering

Awarding institution	Liverpool John Moores University
Teaching institution	Liverpool John Moores University
UCAS Code	D267
JACS Code	H650
Programme Duration	
Language of Programme	All LJMU programmes are delivered and assessed in English
Subject benchmark statement	Engineering Council UK Spec
Programme accredited by	
Description of accreditation	
Validated target and alternative exit awards	Bachelor of Engineering with Honours in Control and Automation Engineering Bachelor of Engineering Honours (SW) in Control and Automation Engineering Bachelor of Engineering in Control and Automation Engineering Bachelor of Engineering (SW) in Control and Automation Engineering Diploma of Higher Education in Control and Automation Engineering Certificate of Higher Education in Control and Automation Engineering
Programme Leader	Clifford Mayhew

Educational aims of the programme

The B.Eng. programme in Control & Automation Engineering has been 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 practice 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:

Provide a programme of study, which develops core knowledge, and understanding of engineering principles, mathematics, and computation, appropriate to the field of Control & Automation Engineering.

Enable students to develop specialist knowledge, intellectual and practical skills that will enable them to analyse, investigate and develop robust solutions to Control & Automation Engineering problems.

Develop relevant study and personal skills so that students progressively take responsibility for their learning, becoming independent learners, while receiving appropriate tutoring and support.

Equip students with a range of transferable skills and attributes in the use of computers, software packages, team working, communication, time management and problem solving methodology which will enable them to undertake responsible roles in industry and commerce.

Provide a degree programme which meets the accreditation requirements of UK Spec and the needs of industry.

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 Control & Automation Engineering in UK and European industry and the operation of Control & Automation Engineering companies.

Alternative Exit/ Interim Award Learning Outcomes - Certificate of Higher Education

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

Level 4 aims to provide students with the fundamental knowledge and key skills required to allow further study at level 5 and 6. The learning outcomes are specifically: Undertake basic mathematical analysis suitable to enable the study of engineering modules at level 4 and level 5. To apply the basic principles of Electrical circuits, Electronics, Programming, Measurement and Control, Communications and Microprocessors to simplified engineering problems. To design, simulate and construct, and test simple circuits. To demonstrate key skills appropriate to the professional engineer

Alternative Exit/ Interim Award Learning Outcomes - Diploma of Higher Education

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

Level 5 builds on the fundamental knowledge gained by students at level 4 to provide an understanding of the core engineering principles expected of a Professional Engineer. The specific learning outcomes are: To undertake advanced mathematical and computational studies of engineering systems and problems associated with the subjects studied at level 5 and level 6. To demonstrate the application of basic principles of Electrical circuits, Electronics, Programming, Measurement and Control and Microprocessors from level 4 to the solution of standard engineering problems. To demonstrate the intermediate engineering skills that will be required for completion of level 6. To demonstrate a clear understanding of the business context of engineering development and activities to demonstrate a range of business skills.

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 programme learning outcomes are as defined by UK Spec and are written in terms of General Learning outcomes and Specific Learning Outcomes. The nomenclature used is taken directly from UK Spec as this is a requirement of the professional bodies involved: General Learning Outcomes The UK Spec states that graduates with the exemplifying qualifications, irrespective of registration category or qualification level, must satisfy the following criteria: Knowledge and Understanding: they 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. Students must demonstrate competency in all UK Spec learning outcomes relevant to their programme. The modules on this programme satisfy all the requirements for Incorporated status as well as partial CEng status

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.

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

Testing of the knowledge base is through a combination of unseen written examinations, and coursework assignment submissions.

Skills and other attributes

Intellectual Skills

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

B1. They 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

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

demonstrated

Engineering Analysis is developed through lectures, case-studies and coursework assignments. Fundamental principles are delivered predominantly by lectures and laboratory classes. More advanced techniques are delivered by project work and coursework supported by lectures.

Assessment

Engineering Analysis and problem solving skills are assessed through a combination of unseen written examinations, assessed coursework and laboratory work, and project work

Professional practical skills

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

C1. They 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.

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

Design is taught by coursework, individual and group project work supported by an appropriate lecture programme

Assessment

Design skills are assessed by coursework, individual and group written design project reports, and student presentations

Transferable / key skills

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

D1. They 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. Specific Learning Outcomes The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

D2. Underpinning science and mathematics: US1. Knowledge and understanding of scientific principles and methodology necessary to underpin their education in Control & Automation Engineering, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies; US2. Knowledge and understanding of mathematical principles necessary to underpin their education in Control & Automation Engineering and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems; US3. Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of Control & Automation and related engineering disciplines. In the context of the BEng programme the student must demonstrate a wide range of abilities in the areas identified by the UK Spec learning outcomes. Scientific principles, developing technologies and computer modelling are a focus of many modules on the programme.

D3. Engineering Analysis: E1. Understanding of engineering principles and the ability to apply them to analyse key engineering processes; E2. Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques; E3. Ability to apply quantitative methods and computer software relevant to Control & Automation and related engineering disciplines, to solve engineering problems; E4. Understanding of and ability to apply a systems approach to engineering problems. Students on this programme must demonstrate a wide range of analysis skills and knowledge and be able to effectively use these techniques to solve engineering problems.

D4. Design: D1. Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues; D2. Understand customer and user needs and the importance of considerations such as aesthetics; D3. Identify and manage cost drivers; D4. Use creativity to establish innovative solutions; D5. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal; D6. Manage the design process and evaluate outcomes.

D5. Economic, Social and Environmental Context: S1. Knowledge and understanding of the commercial and economic context of engineering processes; S2. Knowledge of management techniques which may be used to achieve engineering objectives within that context; S3. Understanding of the requirement for engineering activities to promote sustainable development; S4. Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues; S5. Understanding of the need for a high level of professional and ethical conduct in engineering. Students must be effective and competent working alone and/or in teams and must demonstrate they have a wide range of management and business practice skills. These skills should be demonstrated in modules such

as the individual project and management modules.

D6. Engineering Practice: P1. Knowledge of characteristics of particular equipment, processes or products; P2. Engineering workshop and laboratory skills; P3. Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc); P4. Understanding use of technical literature and other information sources; P5. Awareness of nature of intellectual property and contractual issues; P6. Understanding of appropriate codes of practice and industry standards; P7. Awareness of quality issues; P8. Ability to work with technical uncertainty. Practicing engineers at this level must demonstrate that they have a wide range of knowledge in regulatory, environmental and social as well as ethical considerations. They must also demonstrate a wide knowledge of materials and innovative use of such materials.

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

Engineering Practice permeates almost every activity within the programme content and assessment

Assessment

Assessment of Engineering Practice is varied throughout the programme but is mostly coursework based.

Programme structure - programme rules and modules

Programme rules

Attendance is full-time at Liverpool John Moores University. Each level can be completed in one academic year.

A programme operating within the Framework may be unable to comply with all the requirements of the Framework. In these circumstances the programme team may apply to the Academic Planning Panel for a programme variance which will be considered against agreed criteria that the variance is a nationally published condition of an accrediting / professional body, without which the programme could not be accredited.

Programme Variance

The following programme variances have been approved:

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. For accredited BEng the maximum allowed compensation is 20 credits (Levels 4, 5 and 6).
3. Where a module comprises two or more assessment elements (eg examination and coursework), successful completion of the module should require a mark of greater than 10% less than the module pass mark in each element, as well as the overall module mark being above the normal pass mark (normally 40% or 50%). This requirement only applies to assessment elements that contribute more than 30% towards the final module mark.
4. 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
6000ELE Automation (10 credits) 6001ELE Signal Processing (10 credits) 6005ELE Power Electronics, Drives and Systems (20 credits) 6008ELE Wireless Sensor Networks (10 credits) 6012ELE Process Control (20 credits) 6155ELE Engineering Project (30 credits) 6165ENG Industrial Management (20 credits)		120 core credits at level 6 0 option credits at level 6
Level 5	Potential Awards on completion	
Core	Option	Award Requirements
5001ELE Digital and Embedded Systems (20 credits) 5002ELE Electric Power Engineering		120 core credits at level 5 0 option credits at level 5

(20 credits) 5004ELE Linear Electronics (10 credits) 5005ELE Control System Design and Analysis (20 credits) 5006ELE Electrical Engineering Practice 2 (20 credits) 5012ELE Applied Instrumentation (20 credits) 5121ENG Engineering Mathematics 2 (10 credits)		
Level 4	Potential Awards on completion	
Core	Option	Award Requirements
4000ELE Introduction to Telecommunication Systems (20 credits) 4001ELE Engineering Principles (10 credits) 4002ELE Microprocessors and Software (20 credits) 4003ELE Electrical Circuit Principles (10 credits) 4004ELE Digital and Analogue Electronics (20 credits) 4005ELE Electrical Engineering Practice 1 (20 credits) 4115ENG Engineering Mathematics 1 (20 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 and supported to find and 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. 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 obtain at least two awards and gain at least 160 points, of which at least 80 should be from each of mathematics and a scientific or technical subject relevant to the intended degree (e.g. Physics).

BTEC National Diploma

BTEC National Award

Applicants should have or expect to obtain a grade M in a BTEC National Award in a subject relevant to the intended degree, such as Engineering, ICT Systems Support or Applied Physics, including a Merit in a mathematics unit or relevant Free-Standing Mathematics Qualifications, together with other relevant qualifications to obtain a total of 280 UCAS points

BTEC National Certificate

Applicants should have or expect to obtain a BTEC National Certificate with an overall grade of DD in a subject (including optional units relevant to the intended degree) such as Engineering, ICT Systems Support or Laboratory and Industrial Science. Alternatively, applicants may achieve an overall grade of MM supplemented with relevant qualifications to achieve a total of 280 UCAS points. The BTEC National Certificate should include a merit in a further mathematics unit or be supplemented with appropriate Free-Standing Mathematics Qualifications.

BTEC National Diploma

Applicants should have or expect to obtain a BTEC National Diploma with an overall grade of MMM in a subject (including optional units relevant to the intended degree) such as Engineering, ICT Systems Support or Laboratory and Industrial Science. Alternatively, applicants may achieve an overall grade of MMP supplemented with relevant qualifications to achieve a total of 280 UCAS points. The BTEC National Diploma should include a merit in the further mathematics unit or be supplemented with appropriate Free-Standing Mathematics Qualifications

Other

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

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.