



# Programme Specification

## BENG-RA-2022: Engineering (Robotics and Automation Engineering)

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LU Bachelor of Engineering with Honours awarded by Lancaster University (FHEQ Level 6)

Programme Status: Draft | Version: 2

## Introduction

This programme specification provides a summary of the main features of the Engineering (Robotics and Automation Engineering) programme and includes the learning outcomes that you as a student are expected to have achieved on successful completion of the programme.

Further detailed information related to this programme and the College can be found in the following resources:

- Programme Handbook
- B&FC Admissions Policy
- Work based and placement learning handbook (for foundation degrees)
- Student guide to assessment and feedback

When undertaken as part of a Degree Apprenticeship additional information is available in the following resources:

- The Programme Delivery Plan
- The End Point Assessment Guide
- B&FC Mentor Guide
- B&FC Apprenticeship Strategy

## Key Programme Information

<b>Programme Code</b>	BENG-RA-2022
<b>Programme Title</b>	Engineering (Robotics and Automation Engineering)
<b>Teaching Institution</b>	Blackpool and The Fylde College
<b>Professional, Statutory and Regulatory Body (PSRB) Accreditation</b>	None
<b>UCAS Code</b>	
<b>Language of Study</b>	English
<b>Version</b>	2
<b>Approval Status</b>	Draft
<b>Approval Date</b>	Not yet approved
<b>JACS Code</b>	Other: Other
<b>Programme Leader</b>	Karen Whiteside

## Programme Awards

<b>Award</b>	<b>Award Type</b>	<b>Level</b>	<b>Awarding Body</b>
LU Bachelor of Engineering with Honours	Honours Degree (360 credits)	Level 6	Lancaster University

## Programme Overview

The BEng (Hons) Engineering (Robotics and Automation Engineering) pathway will enable you to gain skills and knowledge in a field at the forefront of technological progress. Robotics and Automation's goal is to increase and streamline productivity, increase health and safety, and provide better services and products faster to a wider consumer base. This innovative and exciting engineering discipline can contribute to the development of technology and is one of the main forces behind the development of science, continually extending capability and the frontiers of human understanding. Robotics research is currently breaking the limits of the possible, developing intelligent, autonomous machines with integrated Artificial Intelligence abilities. The field also integrates various futuristic trends like virtual reality, and will challenge and develop your imagination, creativity and innovation skills. As a robotics and automation

engineer, you will be able to work in various roles involving the development, design, programming, testing and deployment of robotics and automation systems across various sectors of the industry. Pursuing a career in Robotics and Automation, you will develop into an agile and dynamic professional with a flair for focussed continuous professional development and excellent knowledge of current programming and software trends.

## Admission Criteria

A minimum of 48 UCAS points (excluding Functional Skills) in an appropriate discipline:

- DD from A levels to include mathematics and a technology, engineering or science-based subject
- PPP from Extended Diploma, MP from Diploma, MM from 90 Credit Diploma in a science or technology-based subject, including passes in mathematics

- Obtain an overall Pass including a B in the core of the T Level and a Distinction in the Occupational Specialism. Subjects accepted: Maintenance, Installation and Repair for Engineering and Manufacturing, Engineering, Manufacturing, Processing and Control and Design and Development for Engineering and Manufacturing.

**The entry criteria for direct entry onto Level 5 of the programme are:**

- HNC or HND with an overall Merit grade in Mechanical, General or Aeronautical Engineering or another appropriate Engineering discipline
- Applicants for whom English is not their first language are expected to achieve a minimum 6.0 overall with at least 5.5 in each IELTS component.
- Applicants who are able to demonstrate relevant work/life skills or knowledge will also be considered on an individual basis and will be required to attend an interview and provide an up-to-date CV with a professional portfolio, evidencing their capacity to undertake the programme.

Students entering the programme with an HND will need to obtain additional initial advice and guidance on their funding eligibility.

## Career Options and Progression Opportunities

Robotics and Automation offers many exciting prospects. Graduating with a BEng (Hons) qualification will enable you to apply for jobs across a very wide range of sectors and you will be easily able to progress if you develop a habit of lifelong learning. You will most readily find starting jobs in the manufacturing and production sectors where you will either design, develop or maintain robotics and automation systems. On higher levels you may manage teams and industrial facilities and operations. You will often be investigating opportunities to continually improve or extend capability while preserving health and safety. You may also progress into research and development roles.

Robotics and Automation specialists work across all sectors and industries, ranging from defence to manufacturing. Among the sectors currently in expansion are electric vehicles, manufacturing, agriculture and food service, transportation, health and medicine. Career opportunities are booming at all levels in roles such as programmer, designer, researcher, technologist and many others.

While work opportunities may be numerous, there are clear progression routes into post-graduate study and research. You will be able to progress into MEng or MSc in various disciplines, whether continuing with Robotics and Automation or moving into biomedical research, virtual reality, image processing, systems engineering and many others. Major universities across the UK and abroad have post-graduate study opportunities that are highly compatible with Robotics and Automation.

## Programme Aims

- To provide a robust foundation and framework for robotics and automation engineers enriched by the development of core, interdisciplinary and specialist knowledge of robotics and automation systems and technologies, their design, development, control, maintenance and through-life management
- To enable students to independently gain skills, knowledge and confidence in applying proven principles, technological techniques and methods in robotics and automation engineering, leading them to explore and utilise new developments in the field, including research and advanced technologies, to acquire new knowledge, analyse and evaluate new developments in the sector and to apply these appropriately.
- To provide students with the opportunity to gain transferrable knowledge and skills that enable them to engage fully in design, research, development, manufacture planning and control, testing and maintenance of robotics and automation engineering solutions, products and systems that have an impact on the advancement of science and technology.
- To provide academic, technical and professional development through a variety of learning experiences, the development of communication skills and capability of critical analysis, problem solving, the presentation and justification of rational argument and alternative courses of action.
- To enable students to critically evaluate concepts and evidence from a range of sources, and to transfer and apply creativity and innovation skills, exercising significant judgement in a range of situations, accepting responsibility and accountability for determining and achieving personal and team outcomes.
- To educate proficient robotics and automation engineers about responsibility, professional development and lifelong learning, and facilitate opportunities to pursue employment or the level of study which will enable them to continue to excel in their professional lives.
- To graduate professional robotics and automation engineers who have a critical and informed awareness of contemporary issues, legislation, human factors, ecological, sustainability, obsolescence, maintainability challenges, as well as key opportunities of the sector, recognising the impact of customer voice, market trends and industry demands, and who are able to produce or propose sustainable solutions with lasting, impactful outcomes for the success of the industry.

## Programme Learning Outcomes

### Level 6

Upon successful completion of this level, students will be able to:

1. Critically analyse and evaluate complex systems and their interdependencies through the application of systems thinking for the development of manipulation, mobility, data acquisition and control robotic systems via analysis of the wider engineering context in view of integrated solutions adopting a systems approach.
2. Interrogate and resolve problems using a sound evidence base to contribute to improved effectiveness of operator interface, mobility, locomotion, manipulators and effectors, programming, sensing and perception, and their integration in robotic technologies, systems, services, their management, considering legal and ethics issues.
3. Independently analyse essential facts, concepts, and fundamentals of robotics and automation engineering, underpinned by scientific and mathematical principles to identify, formulate and solve robotics and automation engineering problems and to critically evaluate these solutions.
4. Critically analyse, test and evaluate robotics systems and automation processes to identify possible problems, inefficiencies or other issues that may impact users or service providers, evaluating engineering decisions for a more socially inclusive, ethical, economically stable, environmentally sustainable and commercially viable world.

5. Use advanced robotics and automation engineering-specific IT facilities, applying information retrieval, mathematical and statistical methods to plan, develop and work on projects which support extended enquiries into innovative and creative problem solving in the sphere of robotics and automation engineering.
6. Evaluating business, customer and user needs, to independently plan, manage and execute a technically and theoretically informed project, which extensively analyses all aspects of a problem and proposes adequate solutions, broadly deepens knowledge and skills base and critically evaluates expected outcomes.
7. Work in teams, managing tasks and resources to meet changing technical and managerial needs in view of developing industries 4.0 and 5.0 to support design and development processes through cost evaluation, risk management, and to lead continuous quality improvement utilising robust communication strategies.
8. For a variety of audiences, use interpersonal and collaboration skills to communicate technical and non-technical information on solutions that develop innovative ideas and new ways of thinking to support the advancement of robotics and automation engineering practices and knowledge.
9. Formulate innovative solutions, designs, products and services by utilising and applying industry-standard engineering skills through laboratory and workshop activities for planning, designing, analysing, implementing, testing and controlling.
10. Creatively apply, utilise and adapt engineering principles and tools, quantitative science and knowledge towards interdisciplinary projects or to deal with uncertainty and extend technological capability and knowledge base through new applications and techniques.
11. Use general IT facilities and information retrieval skills to plan, develop and execute projects, working as a team on projects that involve technical uncertainty, strive for continuous improvement, and develop the ability to work in different roles.
12. Engage in lifelong learning and continuous professional development while supporting others in their endeavours by developing mentorship and people management skills.
13. Apply health and safety, ethical and sustainability principles, legal frameworks and technical standards to professional practices in an interdisciplinary engineering context which recognises obligations to society, the profession and the environment.
14. Apply robotics and automation engineering principles, knowledge and skills in an interdisciplinary engineering context in view of creating adaptive, sustainable and efficient solutions that correspond to given specifications.

## Programme Structure

Module	Level	Credits	%	Category	Description	Length/Word Count	Grading Method
<b>Stage 1</b>							
B4SCBENG-A: Professional and Academic Skills in STEM (Mandatory)	4	20	60%	Coursework: Essay	n/a	2000	Letter Grade
			40%	Practical: Presentation	(15 minutes)	15	Letter Grade
BENG401: Engineering Mathematics (Mandatory)	4	15	60%	Coursework: Assignment	n/a	2000	Letter Grade
			40%	Written Exam: Formal Written Examination	n/a	150	Letter Grade
BENG403: Engineering Design (Mandatory)	4	15	100%	Coursework: Other	Engineering Product Report and Presentation	4000	Letter Grade
BENG404: Managing Professional Engineering Project (Mandatory)	4	15	90%	Coursework: Project	The project will contain a portfolio of project management documents and a project closure report.	3000	Letter Grade
			10%	Practical: Presentation	n/a	10	Letter Grade
BENG406: Workshop (Mandatory)	4	10	25%	Practical: Practical Skills Assessment	n/a	1400	Letter Grade
			25%	Practical: Practical Skills Assessment	n/a	10	Letter Grade
			25%	Practical: Practical Skills Assessment	n/a	1400	Letter Grade
			25%	Practical: Practical Skills Assessment	n/a	10	Letter Grade
BENG408: Electrical and Electronic Principles (Mandatory)	4	15	50%	Coursework: Other	Research, electrical calculations based on given circuits, simulations and practical	1500	Letter Grade
			50%	Coursework: Other	Research, electrical calculations based on given circuits, simulations and practical	1500	Letter Grade
BENG421: Automation, Robotics and Programmable Logic Controllers (PLCs) (Mandatory)	4	15	50%	Coursework: Assignment	PLC characteristics and practical programming concepts to solve a given engineering problem	2000	Letter Grade

BENG421: Automation, Robotics and Programmable Logic Controllers (PLCs) (Mandatory)	4	15	50%	Coursework: Assignment	Program industrial robots and research on design and safe operation	2000	Letter Grade
BENG422: Digital Principles (Mandatory)	4	15	70%	Coursework: Report	Report including practical tasks	3000	Letter Grade
			30%	Coursework: Report	Report including practical tasks	120	Letter Grade
<b>Stage 2</b>							
BENG501: Research Project (Mandatory)	5	20	90%	Coursework: Literature Review	n/a	3000	Letter Grade
			10%	Practical: Presentation	n/a	20	Letter Grade
BENG502: Professional Engineering Management (Mandatory)	5	20	100%	Coursework: Portfolio / e-Portfolio	n/a	4000	Letter Grade
BENG503: Further Engineering Mathematics (Mandatory)	5	20	50%	Coursework: Assignment	Applied Mathematical Study	1600	Percentage Grade
			50%	Written Exam: Formal Written Examination	n/a	120	Percentage Grade
BENG508: Commercial Programming Software (Mandatory)	5	20	50%	Coursework: Article	n/a	1500	Letter Grade
			50%	Practical: Portfolio / e-Portfolio	n/a	2000	Letter Grade
BENG509: Embedded Systems (Mandatory)	5	20	50%	Coursework: Report	Technical / Laboratory Report	2000	Letter Grade
			50%	Written Exam: Formal Written Examination	Formal Written Examination	120	Percentage Grade
BENG521: Further Electrical, Electronic & Digital Principles (Mandatory)	5	20	50%	Coursework: Assignment	Written coursework based on the triangulation theoretical, experimental and computer simulation	2000	Letter Grade
			50%	Written Exam: Formal Written Examination	n/a	120	Percentage Grade
<b>Stage 3</b>							
BENG601: Major Project (Mandatory)	6	40	5%	Coursework: Other	Proposal	1500	Letter Grade
			80%	Coursework: Report	n/a	10000	Letter Grade
			15%	Practical: Presentation	n/a	20	Letter Grade
BENG603: Control and Simulation (Mandatory)	6	20	40%	Coursework: Report	Technical / Laboratory Report	1600	Letter Grade
			60%	Written Exam: Formal Written Examination	Formal Written Examination	120	Percentage Grade

BENG605: Digital Signal and Image Processing (Mandatory)	6	20	50%	Coursework: Report	Technical / Laboratory Report	2000	Letter Grade
			50%	Written Exam: Formal Written Examination	Formal Written Examination	120	Percentage Grade
BENG606: Electrical Power (Mandatory)	6	20	40%	Coursework: Report	Technical / Laboratory Report	2000	Letter Grade
			60%	Written Exam: Formal Written Examination	Formal Written Examination	120	Percentage Grade
BENG609: Microprocessors and Microcontrollers (Mandatory)	6	20	50%	Coursework: Report	Technical / Laboratory Report	2000	Letter Grade
			50%	Written Exam: Formal Written Examination	n/a	120	Percentage Grade

## Study Workload

This degree is equivalent to 360 credits and the award you will obtain is a Lancaster University Bachelor of Engineering with Honours. This programme requires commitment to attend lectures and workshops at Bispham Campus in line with your study timetable. It is a requirement of the programme that you also undertake appropriate independent study and further reading and assessment.

The programme is offered on a full time basis which will typically require attendance on campus for two full days per week over three years. A part time pathway can be followed from Level 5 onwards, which would typically require attendance on campus one full (long) day per week over 3 years. As well as attendance to lectures, you are expected to undertake sufficient self-directed study. For each hour of class contact, you can typically expect to undertake an additional 2-3 hours of work, however this is dependent upon individual progress. You will need to find the right number of hours based on your own needs. Our tutors can help you with advice and support.

On the full-time programme of study, at Level 4, you should expect to be in College between two and three days weekly. At Levels 5 and 6, the time spent at College is two days weekly. Your time will be divided between practical workshops, labs and lectures. You should plan for a minimum of one additional hour of independent study for each module you have in any semester. It is commonly accepted that 1/3 of your studies is tutor-led in classes, laboratories and workshops, while 2/3 of your studies should be based on independent, self-guided work. One the part-time programme of study, at Levels 5 and 6, you should expect to be in College on a day release if you are in employment with industry. While you may be at work during the rest of the week, it is important to allocate some time for independent study.



### Teaching Methods

The course will be delivered using a range of methods, which may include informal lectures, tutor-led whole group discussions, student presentations, technical workshops, computer laboratory activities, group work, group and individual research and seminars. Some lecturers will use flipped classroom techniques to encourage your intellectual independence. Some tutors will hold their lectures in a blended approach, giving you flexibility to choose your medium of study. You will have access to strong online as well as on-site support throughout your studies.

### Balanced Theory and Practice

Modules are designed to integrate practical and theoretical application. Software and laboratory equipment will be regularly introduced by tutors and applied at relevant points within your studies. When appropriate, field trips to businesses, manufacturing facilities and other industry-specific locations will enable you to see the daily work of industrial engineers and to think of new ways to adapt your industrial engineering knowledge and skills to a variety of sectors. You will have the opportunity to work with case studies and practical tasks. Engaging with companies, the business world and the industry is vital for industrial engineers and that is why you will usually work on real-life examples of the challenges industrial engineers face in their workplace. You will have access to outstanding specialist facilities and equipment including our Advanced Technology Centre and our new laboratories. This will allow you to work with industry-standard equipment and software relevant to your future engineering career.

### One-on-one Support

Tutors are very accessible and supportive and eager to enhance your learning experience through one-on-one assistance when needed. You will also have a dedicated progress tutor along with support from the College higher education learning mentors. You will significantly benefit from relatively small class sizes and a warm and friendly learning environment which encourages effective group interaction. For your major project, you will have a dedicated supervisor in addition to your module tutor who will provide you with supportive one-on-one discussions and will have weekly meetings with you. You will be shown various knowledge-based items, tools and techniques and will be able to practice with them where appropriate to reinforce the taught portion of some sessions. Independent research will allow development of additional tools and techniques as appropriate to your chosen specialism. This becomes more important as you progress through the programme.

### Independent Learning

All higher education programmes are designed so that you are able to progressively develop independent learning skills and aptitudes. Learning independently is a key skill of all graduates when they enter the work place and one which we aim to develop further during your time with us. As you begin your programme you will be more intensively supported to develop the skills of learning and learning how to learn. As you progress you will be given the opportunity to apply these skills and to manage your own study time and activities with the goal of becoming a truly independent learner ready to get the most out of graduate employment opportunities. Your Personal Development planning activities are a key component in developing these independent learning skills and your tutors, support mentors and peers can help you to organise and structure this aspect of your learning and development.

## Programme Delivery: Assessment

Various modes of assessment will be used in different modules to ensure all aspects of learning are assessed and that you are competent in different forms of demonstrating your knowledge. These will range from real world case studies, live presentations and briefing sessions, written assessments, computer aided design projects and written examinations. You will be supported in the preparation for assessments via readily available tutorial sessions and tutor support. Some assessments may already be very familiar, such as essays, exams, and reports. However, in higher education there are a great many varieties of assessment depending on the subject, the level and the type of course. Our higher education courses often integrate academic and work-based learning so assessment may include aspects of personal reflection, portfolio building and case studies.

The assessments for this programme are based on a combination of coursework, exams and practical assignments.

### Coursework

Coursework might range from written tasks (essays, reports, reflective research) and assignments to the collation of portfolio of evidence based around a work placement or a set of laboratory tasks. Coursework differs from exams in that it will usually have a submission deadline within several weeks, and will be carried out independently.

### Exam

Exams are formal, timed assessments, carried out in a controlled environment and overseen by one or more invigilators. They assess your grasp of the theory and underpinning knowledge related to your chosen career area. The opposite of practicals, they require you to present your practical understanding within an academic context. Some modules have no exams, but most modules incorporating elements of mathematical analysis will have an exam.

### Practical

Practical assessments test your technical ability, and assess the level of application to real or contextualised tasks in your chosen career area. They can be timed or non-timed and involve observation of your practical skills and competencies, either in a work-based environment or a dedicated laboratory setting that closely resembles the workplace. Practical work-based assessments are supported and carried out by a trained assessors. Practical assessments may include presentations or demonstrations of prototypes you have developed.

## Programme Delivery: Work Based and Placement Learning

The programme has been designed to align carefully with the needs of industry.

Although an industry placement is not an integral part of the course, you are strongly encouraged to gain industry experience via summer internships, short courses in industry and industrial visits. We regularly invite guest speakers, employers and alumni at relevant points throughout your studies to integrate your academic and work based experience.

Case studies from industry will be embedded within specific modules and will feature throughout the course, as will the development of those attitudes and behaviours expected of a professional engineer. Students who are in work placement or in employment with industry will be encouraged to contextualise their coursework to their engineering activities to strengthen their understanding of theory within a practical context.

Throughout your study with us you may be invited or encouraged to participate in field trips, activities and events or professional development opportunities, research events and webinars supported by the IET or the IMechE. These opportunities will help you to develop a well-rounded employability profile within engineering.

## Programme Delivery: Graduate Skill Development

The BEng (Hons) Engineering (Robotics and Automation Engineering) programme offers you the opportunity to experience and develop a range of skills related to the discipline. These include accessing and evaluating information from a range of technical sources and communicating findings in a range of ways suitable to engineering. Teaching, learning and assessment methods allow development of key transferable skills such as problem solving, ethics and globalization through communication and digital literacy. The production of assessment work in varied formats such as engineering reports, essays, oral presentations and discussions will contextualize the communication and cognitive requirements of modern employable engineers. Modules are designed to develop your existing skills to enable you to become an independent engineer, providing the basis for a successful career in engineering, developed through industry and academic research and enquiry. Further skills in technical information analysis and application will be developed during the delivery of the programme content through lectures, guest speakers and research into engineering systems, sub-systems and approaches.

The following strands linked to graduate outcomes have been identified for the programme:

- Collaborative teamwork and leadership skills: Introduction to Academic Study and Managing a Professional Engineering Project are the two modules that will require you to build solid teamwork and leadership skills. Collaborative projects and assignments will help you enhance and practice this skill set. You will use these skills throughout your studies and across all other modules.
- Communication, information and digital literacies: Engineering Design as well as project and Introduction to Academic Study work will enhance your presentation and communication skills. You will learn to gather and analyse data, and decide which information is relevant and how to use it, and present it effectively and professionally. Will learn more about stakeholders and how to change your communication strategies based on their needs and requirements.
- Personal and intellectual autonomy: Throughout your studies, you will have to learn to become increasingly independent and self-reliant while continuing to participate in group and teamwork. Engineering Mathematics and Engineering Design specifically require a considerable amount of individual work. It is imperative that you gain autonomy at Level 4 so as to be able to cope with work on Level 5.
- Ethical, social and professional understanding: With the modules Professional Engineering Management, you will gain a considerable amount of professional skill and understanding and will begin to apply industrial engineering principles to various engineering problems. These will

include issues that may have ethical, social, community impacts and you will need to consider these in your work.

- Global citizenship: the modules at Level 5 all consider issues of global importance and the examples that you will cover in specialist modules will usually related to issues such as sustainability, innovation, finding suitable solutions to problems arising from an increasingly global society.
- Enterprise and entrepreneurial awareness and capabilities: Professional Engineering Management and Research Project are modules that will greatly expand your entrepreneurial awareness and options in this field. Backed up by the specialist modules at this level, you will get insights into the various options individual or team enterprises have and how you can innovate and create.
- Research, scholarship and enquiry skills: You will be applying all other skills and attributes acquired at Level 4 and 5 to the Major Project module which will build your research, scholarship and enquiry skills to produce an original piece of research on a topic of interest to your field.
- A commitment to lifelong learning and career development: From Level 4 study onwards, personal development plans (PDP's) will be driven through a tutorial system and will focus on identifying the skills and attributes of graduate engineers as employees, with the formulation and setting of action plans to achieve them. At Level 6 you will already be familiar with the many options Electrical and Electronic Engineering presents and you will be expected to have an awareness of the professional development path you would like to pursue. Your tutors will help you with advice. All modules will allow you to expand your professional skills and knowledge and will help you pick a direction for lifelong learning and development. There is a strong emphasis on employability and enhancement of graduate skills in all years of the BEng programmes.

### **Study Costs: Equipment Requirements**

At College, you will have access to all the necessary software and hardware, library and scholarly works that you will need to complete your assignments. However, it is a good idea to invest in a computer or laptop for your studies as well as in a scientific calculator.

### **Study Costs: Additional Costs**

You may encounter some additional costs during your studies, which could include non-mandatory field trips. It is recommended to obtain a student membership with the IET (non-mandatory), which is £20.00 for a year and £50.00 for the duration of the entire course, and which will give you access to a number of events and opportunities for your continuous professional development.

### **Related Courses**

- BEng (Hons) Engineering (Aerospace Engineering)
- BEng (Hons) Engineering (Mechanical Engineering)
- BEng (Hons) Engineering (Industrial Engineering)
- BEng (Hons) Engineering (Electrical and Electronic Engineering)