

Programme Specification

BEng (Hons) Autonomous Robotics

Section 1: General Information

Awarding Body:	NMITE
Teaching Institution:	NMITE
Programme Title:	BEng (Hons) Autonomous Robotics
Total Credits for Award:	360
Interim Exit awards:	Certificate in Higher Education in Engineering (120 credits) Diploma in Higher Education in Engineering (240 credits) BEng (ordinary degree) Autonomous Robotics (300 credits)
UCAS Code	IEU5
HECOS Code	100184 (general or integrated engineering) 100170 (mechatronics and robotics)
Mode of Study	Full-time – accelerated (2 years) or standard (3 years)
Delivery Location:	Blackfriars and Skylon Campuses
Professional Accreditation:	NMITE will be seeking accreditation from the IET that this programme meets the requirement for partial CEng

Section 2: Programme Aims and Learning Outcomes

Programme Aims

The programme aims to:

- Satisfy the necessary educational standards for the award of Partial CEng (BEng) Engineer by meeting the requirements of the Engineering Council Accreditation of Higher Education Programmes version 4;
- Imbue students with knowledge and understanding of autonomous robotics, gained through effective learning approaches, and interaction with employers and the community;
- Nurture an ability to gain, apply, integrate, and generate engineering insight whilst demonstrating sensitivity to environmental, social, legal and ethical responsibilities;
- Encourage a desire to identify problems that need solving, and to find creative solutions to society's challenges; and
- Develop agile, independent, curious, resilient and passionate engineers in autonomous robotics.

Programme Learning Outcomes

The learning outcomes of the programme align with the partial CEng Engineer level of UK-Spec.

At the end of level 6, students will be able to:

Subject Specific Knowledge and Skills

6a1 Identify, describe and apply a broadening range of engineering concepts with particular attention to integration of engineering sub-disciplines, including contexts at the forefront of the field of study.

6a2 Select and apply mathematical analysis, modelling and/or optimisation approaches to reach substantiated conclusions to problems that exhibit more complexity (in functional requirement and/or level of uncertainty), recognising the limitations of the techniques employed.

6a3 Apply principles of engineering and project management, legal and commercial factors that influence the practice of engineering to generation of engineering solutions, applying strategies appropriate to the specific commercial context.

6a4 Apply design skills, underpinning knowledge and an integrated engineering approach to create relatively complex engineering designs that meet a combination of (potentially conflicting) user and contextual needs.

- 6a5 Identify opportunities to minimise adverse environmental and societal impacts of engineering, applying and evaluating effective strategy(ies) through reasoned choices informed by professional codes of conduct.
- 6a6 Adopt a holistic and proportionate approach to the mitigation of security risks.
- 6a7 : Discuss the role of quality management systems and continuous improvement in the context of complex problems.
- 6aR1 Design and implement advanced autonomous robotic systems by integrating perception (including computer vision), localisation, mapping, planning, and control in complex and uncertain environments.
- 6aR2 Critically evaluate and apply advanced algorithmic methods to solve robotics problems under uncertainty, justifying design decisions and analysing trade-offs in performance, robustness, and system constraints.

Professional Capabilities

- 6b1**: Develop communication, teamwork and project management skills to a professional standard and be proactive in taking responsibility for the success of a project.
- 6b2**: Use workshop and experimental skills to investigate complex problems, proposing appropriate methodologies and risk assessing one's own practical work.
- 6b3**: Demonstrate continued personal improvement in confidence and effectiveness across repertoire of communication methods with a wider range of audiences.
- 6b4**: Complete a focused literature review for a defined question using scholarly, technical and grey literature.
- 6b5**: Plan and record self-learning and development as the foundation for lifelong learning/CPD.

Section 3: Curriculum Structure

Code	Module Title	Credits	Mandatory/ Optional
<i>Level 4</i>			
E4009	The Twenty-First Century Engineer	30	M
E4010	Thermodynamics and Fluids	30	M
E4011	Statics and Dynamics of Simple Mechanisms	30	M
E4012	Fundamentals of Analogue and Digital Circuits	30	M

Level 5

E5009	Design Concepts and Prototypes	30	M
E5014	Systems Engineering for Robotics	30	M
E5011	Statics and Dynamics of Complex Mechanisms	30	M
E5013	Mechatronics and Control	30	M

Level 6

E6008	People and Projects in Engineering	30	M
E6014	Autonomous Mobile Robots	30	M
E6015	Autonomous Drones	30	M
E6011	Bachelor's Project	30	M

Section 4: Distinctive Programme Features

Autonomous Robotics offers a qualitatively different course in both learning delivery and learning environment. There is a high level of supported teamwork to develop transferable skills, support students, and mimic the workplace. There is significant involvement of external commercial partners throughout the curriculum that clearly differentiates NMITEs approach from other Autonomous Robotics courses. And there is a wider and more ambitious involvement of the humanities in what remains an accredited engineering course. Finally, the pedagogy and curriculum work together to develop work-ready graduates, a sustained need that continues to be articulated by industry (e.g. Engineering UK 'State of Engineering' 2022).

Section 5: Teaching, Learning, Assessment & Support for Learners

Teaching & Learning

This is a studio-based course with high levels of social and active learning, meaningful reflection and consolidation space, well-structured and explicit professional skills, an assessment-for-learning philosophy and carefully supported interactions with industry and community.

The programme is challenge-led and utilises uses block delivery of learning with deep integration of employers and the community in the learning experience. Modules are taken sequentially and are typically 7 weeks in duration. In each 7-week module, students will undertake real-world challenges while working predominantly as teams in a studio environment and in the Project

Workspace. Each challenge highlights and hones areas of engineering expertise in autonomous robotics and embeds humanities and social science subjects while maintaining the integrated approach intrinsic to the programme.

NMITE views communication, mathematics and IT as vital tools but does not believe a high-level of knowledge in these subjects should be a pre-requisite to studying engineering. In line with its overall approach to teaching, NMITE will support, scaffold, promote and advance communication, mathematics, and IT learning 'through doing' as part of the modules that students study. This essential part of the programme is supported by The Academic Skills and Knowhow Centre (ASK). The ASK is a collaborative centre bringing together the expertise of the communication, mathematics, and ICT educators. The ASK centre staff supports learning both within module delivery and by offering individual and group-based support to students on a demand-led basis.

Support for Students and their Learning

Students at NMITE are able to access a range of support via Student Services, which provides both direct support and signposting on a range of issues including student living, health and wellbeing, money matters and student engagement and representation. Student Services is based at the Blackfriars Campus, with a daily presence at the Skylon Campus, and students are able to access support both on a drop-in basis and also via a bookable appointments system.

Each student is allocated a Personal Tutor upon arrival at NMITE. Personal Tutors are the first point of contact for academic advice and guidance. They monitor students' progress, provide structured support for academic and professional development, and support students' wellbeing, working closely with Student Services.

The Academic Skills and Knowhow Centre is a key element of supporting students within NMITE with their broader academic learning. Students can drop in to The ASK for support with their learning, or book individual and group-based support sessions.

The Autonomous Robotics programme is based at NMITE's Blackfriars Campus which has The Factory facility that students use as part of their programme and for self-directed projects individually or in teams. As students progress through the programme, they will move to NMITE's Skylon Campus, which houses the Project Workspace, where students will work individually and in teams to implement robotics challenges. Meetings with industrial partners will also take place in the Project Workspace, enabling partners to assess the performance of the developed robotic solutions. Students have access to the VLE Canvas, on which they can access all key programme information together with a range of learning materials to support them. Students also have use

of books at Hereford Library and are also provided with access to online journals and a 'Resource Room' within The ASK at the Blackfriars Campus.

Assessment

Each module will involve multiple pieces of summative assessment. NMITE utilises a range of summative assessment methods including: Artefact, Specification, Presentation, Tutorial Questions, Lab Report, Report, Design, Portfolio, Essay, Project Plan (& Commentary), Poster, Business Case, Video, Dissertation, Viva Voce, Q&A and Blog post.

Across the programme, students undertake both individual assessment and team based assessment. NMITE has a range of strategies to support effective teamworking and a policy that allows for individual marks to be awarded to individual students in the case of groupwork where there is evidence that individual achievement of learning outcomes is inconsistent between group members. Further, every AHEP learning outcome is, at some point in the programme, assessed individually.

Section 6: Admissions Criteria

Admissions requirements are:

- GCSE Maths and English should be Grade 5 or above **AND**
- 112-144 UCAS points or equivalent **OR**
- RPEL admission for applicants with prior experiential learning who demonstrate a strong probability of likely success **OR**
- BTEC Nationals and Apprenticeships **OR**
- Overall pass in International Baccalaureate including at least 16 points from three Higher Level subjects **OR**
- Successful completion of the NMITE foundation year.

Students whose first language is not English:

- IELTS 6.0 (with minimum of 5.5 in each component), *on condition of students having received English-medium instruction and passed a qualification at Level 2 or above;*
 - IELTS 6.5 (with a minimum of 6 in each component), *where students do not have English-medium instruction at Level 2 or above*
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Section 7: Internal and External Reference Points

QAA Subject Benchmark Statement	Subject Benchmark Statement - Engineering
Other external Benchmarks used to inform Programme	The Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies UK Quality Code for Higher Education 2024
Internal Reference Points	NMITE Graduate Attributes.docx NMITE Guiding Principles for Learning and Teaching .docx



Section 8 Programme Structure and level learning outcomes

8.1 Level 4

At the end of level 4, students will be able to:

Subject Specific Knowledge and Skills

- 4a1: Identify, describe and apply engineering concepts relevant to the course focus.
- 4a2: Deploy introductory skills in mathematical analysis to reach substantiated conclusions to straightforward, clearly defined technical challenges.
- 4a3: Describe and demonstrate understanding of engineering and project management, legal and commercial factors that influence the practice of engineering.
- 4a4: Apply design skills and underpinning knowledge to create simple engineering designs using a multi-disciplinary approach.
- 4a5: Describe the environmental, ethical and societal impact of engineering.

Professional Capabilities

- 4b1 Describe their own responsibilities to equality, diversity and inclusion and how such responsibilities are important to engineers and employees.
- 4b2 Deploy team management practices in team-based challenges, critically reflecting on their own effectiveness.
- 4b3 Demonstrate workshop skills and the ability to conduct experiments using given instructions and direction.
- 4b4 Communicate engineering or related work in variety of oral, media and/or written formats.
- 4b5 Use provided technical literature to inform decision making.



Level Modules

		<i>Credits</i>	<i>Is module Compensata ble (Y/N)</i>	<i>Level Learning outcomes this module supports</i>	<i>Graduate Attributes this module supports</i>	<i>PSRB requirements for this module (if applicable)</i>
<i>Code</i>	<i>Name</i>					
E4009	The Twenty-First Century Engineer	30	Y	4a1, 4a2, 4a5, 4b1, 4b3, 4b5	C1, C2, C3, C4, C5, I1, I2, I3, I4, I5, P1, P2, P3, P4, P5	See AHEP mapping spreadsheet
E4010	Thermodynamics and Fluids	30	Y	4a1, 4a2, 4b3	C4, I1, I2, I4, P1, P2, P3, P4, P5	
E4011	Statics and Dynamics of Simple Mechanisms	30	Y	4a1, 4a2, 4a4, 4b3	C5, I1, I4, P2, P3, P4, P5	
E4012	Fundamentals of Analogue and Digital Circuits	30	Y	4a1, 4a2, 4a4, 4b2, 4b4	C5, I1, I2, P1, P2, P3, P4, P5	

Certificate in Higher Education Engineering – exit qualification on successful completion of all level 4 credits (120)



8.2 Level 5

At the end of level 5, students will be able to:

Subject Specific Knowledge and Skills

5a1 Identify, describe and apply a wider range of engineering concepts relevant to the course focus.

5a2 Deploy mathematical analysis and modelling approaches to reach substantiated conclusions to problems that exhibit more complexity (in functional requirement and/or level of uncertainty).

5a3 Apply principles of engineering and project management, legal and commercial factors that influence the practice of engineering to generation of engineering solutions, demonstrating sensitivity to commercial context.

5a4 Apply design skills and underpinning knowledge to create relatively complex engineering designs using an integrated engineering approach.

5aR1 Design, develop, and integrate robotic systems by applying principles of sensing, actuation, embedded systems, and robotics software within simulated and real-world environments.

5aR2 Apply and evaluate fundamental robotics algorithms and middleware-based solutions to defined problems, analysing trade-offs in performance, robustness, and computational requirements.

Professional Capabilities

5b1 Interact effectively with team members in all team-based challenges.

5b2 Develop workshop skills by selecting appropriate materials and processes and, with guidance, risk assessing one's own practical work.

5b3, Propose experimental approaches that answer predetermined questions/hypotheses.

5b4 Demonstrate personal improvement in confidence and effectiveness across repertoire of communication methods, planning and recording self-learning and development.

5b5: Critically evaluate and select relevant technical and grey literature to inform decision making.



Level 5 Modules

<i>Compulsory Modules</i>		<i>Credits</i>	<i>Is module Compensatable (Y/N)</i>	<i>Level Learning outcome this module supports</i>	<i>Graduate Attributes this module supports</i>	<i>PSRB requirements for this module (if applicable)</i>
<i>Code</i>	<i>Name</i>					
E5009	Design Concepts and Prototypes	30	Y	5a3, 5b1, 5b2, 5b3, 5b4	C1, C2, C3, I1, I5, P1, P2, P3, P4, P5	See AHEP mapping spreadsheet
E5014	Systems Engineering for Robotics	30	Y	5a1, 5a2, 5aR1, 5aR2, 5b3, 5b4, 5b5	C1, C4, I1, I2, I3, I4, P2, P3, P5	
E5011	Statics and Dynamics of Complex Mechanisms	30	Y	5a1, 5a2, 5a3, 5b2, 5b3	C5, I1, I2, I5, P1, P2, P3, P5	
E5013	Mechatronics and Control	30	Y	5a1, 5a2, 5a4, 5b2	C2, C5, I1, I2, I3, P2, P4	

Exit qualification at this level: **Diploma in Higher Education in Engineering**



8.3 Level 6

At the end of level 6, students will be able to:

Subject Specific Knowledge and Skills

6a1 Identify, describe and apply a broadening range of engineering concepts with particular attention to integration of engineering sub-disciplines, including contexts at the forefront of the field of study.

6a2 Select and apply mathematical analysis, modelling and/or optimisation approaches to reach substantiated conclusions to problems that exhibit more complexity (in functional requirement and/or level of uncertainty), recognising the limitations of the techniques employed.

6a3 Apply principles of engineering and project management, legal and commercial factors that influence the practice of engineering to generation of engineering solutions, applying strategies appropriate to the specific commercial context.

6a4 Apply design skills, underpinning knowledge and an integrated engineering approach to create relatively complex engineering designs that meet a combination of (potentially conflicting) user and contextual needs.

6a5 Identify opportunities to minimise adverse environmental and societal impacts of engineering, applying and evaluating effective strategy(ies) through reasoned choices informed by professional codes of conduct.

6a6 Adopt a holistic and proportionate approach to the mitigation of security risks.

6a7 : Discuss the role of quality management systems and continuous improvement in the context of complex problems.

6aR1 Design and implement advanced autonomous robotic systems by integrating perception (including computer vision), localisation, mapping, planning, and control in complex and uncertain environments.

6aR2 Critically evaluate and apply advanced algorithmic methods to solve robotics problems under uncertainty, justifying design decisions and analysing trade-offs in performance, robustness, and system constraints.



Professional Capabilities

- 6b1:** Develop communication, teamwork and project management skills to a professional standard and be proactive in taking responsibility for the success of a project.
- 6b2:** Use workshop and experimental skills to investigate complex problems, proposing appropriate methodologies and risk assessing one's own practical work.
- 6b3:** Demonstrate continued personal improvement in confidence and effectiveness across repertoire of communication methods with a wider range of audiences.
- 6b4:** Complete a focused literature review for a defined question using scholarly, technical and grey literature.
- 6b5:** Plan and record self-learning and development as the foundation for lifelong learning/CPD.



Level Modules

<i>Compulsory Modules</i>		<i>Credits</i>	<i>Is module Compensatable (Y/N)</i>	<i>Level Learning outcome this module supports</i>	<i>Graduate Attributes this module supports</i>	<i>PSRB requirements for this module (if applicable)</i>
<i>Code</i>	<i>Name</i>					
E6008	People and Projects in Engineering	30	Y	6a3, 6a7, 6b1, 6b3	C3, C5, I3, I4, P1, P5	See AHEP mapping spreadsheet
E6014	Autonomous Mobile Robots	30	Y	6a2, 6aR1, 6aR2, 6b1, 6b2, 6b3, 6b4, 6b5	I1, I2, I3, P2, P4	
E6015	Autonomous Drones	30	Y	6a2, 6aR1, 6aR2, 6b1, 6b2, 6b3, 6b4, 6b5	C4, C5, I1, I3, I4, P1, P3, P4, P5	
E6011	Bachelor's Project	30	N	6a1, 6a2, 6a5, 6b3, 6b4, 6b5	C5, I2, I3, I4, I5, P2, P4	

Exit qualification at this level: BEng Autonomous Robotics (ordinary degree) (300 credits)

Version Control: BEng Autonomous Robotics Programme Specification	
Version No	V1 – draft for validation
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Summary of Changes made to this Version	N/A – draft for final validation panel

Please note: This specification provides a concise summary of the main features of the programme. More detailed information on the learning outcomes, content, and teaching, learning and assessment methods for each module on the programme can be found in the individual module descriptions and programme regulations.

The accuracy of the information contained in this document is reviewed by NMITE; changes to this information can only be made through the approved programme and module change procedures.