Middlesex University

Programme specification

1. Programme title

MSc Robotics and AI

Target Award Title(s):

MSc Robotics and AI

Exit Award Title(s):

PGCert Robotics and AI

PGDip Robotics and AI

2. Awarding institution

Middlesex University

3. Teaching institution

Middlesex University London

4. Length and mode of study

a) Length and mode:

Full-time (FT)	Semester 1	1 Years
Part-time (PT)	Semester 1	2 Years

b) Delivery method: On Campus/Blended Learning

5. Professional/Statutory/Regulatory body (if applicable)

N/A

6. Apprenticeship standard (if applicable):

N/A

7. Language of study

English

8. Will this be delivered as a Continuing Professional Development (CPD) programme?

No

9. Criteria for admission to the programme

An Honours degree normally classified 2.2 or above, or equivalent, in engineering, computer science or a related area, with evidence of previous programming experience in a high-level language such as C or Python. Applications from mature applicants with suitable skills and experiences are also welcomed, highlighting our flexible admission criteria. Recognition of Prior Learning (RPL) is permitted.

Successful applicants must have competence in English language. For international applicants whose first language is not English the requirement is that they have IELTS 6.5 (with minimum 6.0 in each component) or TOEFL internet based 87 (with at least 21 in listening & writing, 22 in speaking and 23 in reading).

Principle of fair admission

The University aims to ensure that its admissions processes are fair, open and transparent and aims to admit students who, regardless of their background, demonstrate potential to successfully complete their chosen programme of study where a suitable place exists and where entry criteria are met. The University values diversity and is committed to equality in education and students are selected on the basis of their

individual merits, abilities and aptitudes. The University ensures that the operation of admissions processes and application of entry criteria are undertaken in compliance with the Equality Act.

We take a personalised and fair approach to how we make offers. We feel it’s important that our applicants continue to aspire to achieving great results and make offers which take into account the information provided to us on the application form.

This includes recognition of prior learning and experience. If you have been working, or you have other learning experience that is relevant to your programme, then we can count this towards your entry requirements and even certain modules once you start studying.

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10. Aims of the programme

The programme aims to:

The programme aims to develop competent and highly sought after Robotics Engineers by equipping them with the cutting-edge technologies within the area of robotics, machine learning and autonomous robotics. It will achieve this by consolidating key technological knowledge and skills in designing and developing robotic and automation systems for a variety of industry applications and for a diverse range of employment sectors such as industrial automation, robotics, systems integration, mobile robotics.
The programme will also focus on equipping students with new skills and knowledge needed for implementing technologies such as Artificial Intelligence/Machine Learning for Robotic applications, Cyber Physical Systems, Digital Twins, Remote Monitoring and Data Analytics and other such technologies by working closely with industry partners leading the development of these technologies. The students will also be exposed to developing sustainable robotic solutions that address global challenges in areas like environmental monitoring, disaster management and ageing populations.

11. Programme learning outcomes

Programme - Knowledge and Understanding

On completion of this programme the successful student will have a knowledge and understanding of:

1. Apply a comprehensive knowledge of relevant subject principles (engineering, statistics, mathematics, management) to the solution of complex problems in robotics and automation. (AHEP4 M1)

2. Critically analyse hardware and software requirements of robotic systems and related sensing and control methods.

3. Design, develop and test control solutions for autonomous robotic systems, including machine learning.

4. Formulate and critically analyse complex robotic systems and to offer conclusions and further recommendations. (AHEP4 M2)

5. Develop a system hierarchy for robotic hardware and software integration solutions, including mode of communications and networking.

6. Formulate and apply fundamental simulation techniques using a systems approach to real-world processes and systems.

7. Design solutions for complex problems that evidence some originality to address stakeholder needs (user, business, societal, environmental, cultural, diversity, inclusion, etc.), as well as complying with constraints such as commercial, legal, professional and industry standards. (AHEP4 M5)

Programme - Skills

On completion of this programme the successful student will be able to:

8. Select and apply computational and analytical techniques to model complex problems related to robotic systems. (AHEP4 M3)

9. Build, test and optimise integrated robotic system solutions using appropriate tools and techniques.

10. Produce digital models with integrated data flow between physical and virtual systems and their behaviour.

11. Carry out technical literature reviews and critically evaluate these to solve complex problems related to the programme. (AHEP4 M4)

12. Design and implement AI/ML solutions for robotic systems and applications.

13. Evaluate the business, environmental and societal impact of solutions to complex problems and manage their impact by considering using Product Lifecycle Management approaches, including Product Data management and Application Lifecyle Management. (AHEP4 M7)

14. Work effectively as a reflective practitioner as a member of a team as well as an individual and assess own and team performance. (AHEP4 M16)

15. Communicate complex technical and academic content effectively in both oral and written forms to a technical and non-technical audience. (AHEP4 M17)

12. Learning and teaching methods

A.Knowledge and understanding

Students gain knowledge and understanding through a dynamic mix of teaching, learning, and assessment strategies, designed to actively engage them and enhance their comprehension. The educational context is enriched with staff-led interactive sessions, which delve into theoretical concepts in a multi-disciplinary context. These engaging sessions are complemented by hands-on laboratory activities, crucial for reinforcing theoretical knowledge through practice-led experiments and simulations, allowing students to apply their learning in tangible scenarios.

To broaden their understanding, students participate in a variety of interactive activities including workshops, group tutorials, and collaborative exercises. These are crafted to foster critical thinking, problem-solving, and the application of theory to practical, real-life societal challenges, with a particular focus on sustainable development and the UN Sustainable Development Goals (SDGs). Additionally, students undertake individual and group projects, encouraging research-informed exploration and synthesis of information, thereby deepening their subject mastery.

Guided and independent study is highly promoted, complementing formal instruction. This self-directed exploration is supported by comprehensive resources such as key concept videos provided in advance, enhancing digital learning, and offering opportunities for students to deepen their understanding, explore topics more extensively, and adopt a global perspective.

B.Skills

Students develop their skills within a stimulating and diverse teaching and learning framework, designed to nurture practical abilities, critical thinking, and teamwork. This dynamic setting encourages the acquisition

of vital professional competencies through a blend of interactive sessions, guided learning, and academic advising.

Central to our approach are practice-led workshops that integrate multidisciplinary learning, encompassing engaging discussions, group tutorials, and hands-on laboratory work. These sessions offer an immersive experience, allowing students to apply theoretical concepts in real-world contexts, thereby enhancing their technical and analytical skills.

Seminars and laboratory exercises immerse students in experiential learning, emphasizing the application of knowledge to practical challenges and encouraging collaboration. This environment promotes active engagement and peer learning, deepening students' understanding of complex issues and fostering inclusive approaches to problem-solving.

Projects, undertaken both individually and in groups, are key to our pedagogy. They provide a platform for students to engage with comprehensive tasks that mirror industry problems, demanding creativity, critical evaluation, and strategic thinking. These projects often incorporate global and employer perspectives, highlighting the relevance of sustainable development and the application of research-informed strategies.

Utilising state-of-the-art simulation tools and engaging in testing activities, students gain insights into the practical aspects of their field, from conceptual design to tangible outcomes, preparing them for industry-specific tasks and decision-making.
With the aid of key concept videos provided in advance and a strong emphasis on digital learning, we offer a well-rounded educational experience. This approach not only ensures the acquisition of theoretical knowledge but also emphasizes the development of practical skills and competencies essential for success in the global marketplace. Through work-based learning opportunities and industry engagement, we prepare

students for the realities of their future careers, all while maintaining a focus on health and well-being.

For MSc Robotics and AI with Professional Placement (15 months) / MSc Robotics and AI with Professional Placement (24 months) only
A unique feature of the programme is the inclusion of placements as a structured learning method. Placements provide students with an immersive experience, allowing them to apply theoretical knowledge in real-world industry settings. This hands-on approach enables students to develop professional skills, gain valuable insights into applying their skills and build confidence in tackling industry challenges. Placements also allow students to bridge the gap between academic learning and practical application, enhancing their employability and preparing them for leadership roles in the engineering sector.

Approx. number of timetabled hours per week (at each level of study, as appropriate), including on-campus and online hours FT 12PT 6

Approx. number of hours of independent study per week (at each level of study, as appropriate)FT 28PT14

Approx. number of hours on placement (including placement, work-based learning or year abroad, as appropriate). Where relevant, provide further details under 13c below.

3 months (15 months programme) or 36-48 weeks (24 months programme)No part-time placement option

13. Employability

a) Development of graduate competencies

MSc Robotics and AI graduates will develop Leadership and Influence by taking initiative in research projects, group assignments, and

innovation-driven collaborations. They will cultivate decision-making skills by balancing technical feasibility, safety, and ethical considerations in robotics applications. By mentoring peers, they will enhance their ability to lead and inspire others. Public speaking through technical presentations and outreach activities will further solidify their leadership presence in academia and industry.

Curiosity and lifelong learning are essential for robotics professionals. Graduates will stay ahead in rapidly evolving fields by engaging in interdisciplinary learning, integrating AI, control systems, and mechatronics into their expertise. They will actively follow robotics research in leading journals and conferences such as ICRA and IROS. Participation in hackathons, robotics competitions, and industry projects like the Siemens Connected Curriculum will help them apply theoretical knowledge to real-world challenges. They will also experiment with new robotics frameworks, programming languages, and hardware platforms to continuously expand their technical skill set.

Effective Communication, Empathy, and Inclusion are critical for engaging with diverse audiences in robotics. Graduates will develop strong technical writing skills for research papers, technical reports, and documentation. They will refine their ability to present complex ideas clearly in potential academic conferences and industry showcases. Through active listening and constructive feedback, they will foster inclusive and effective teamwork.

In a highly collaborative field, graduates will excel in Collaborative Innovation, working across disciplines such as AI, mechatronics, software development, and cognitive sciences. They will actively contribute to open-source robotics projects, leverage Agile methodologies, and use tools like Git and ROS for efficient collaboration. Participating in robotics challenges, industry-academia partnerships, etc. will allow them to push the boundaries of robotic technology. By embracing teamwork and knowledge-sharing, they will drive forward novel solutions in robotics research and development.

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Resilience and adaptability are essential qualities in robotics, where unexpected challenges and failures are part of the process. Graduates will develop the ability to learn from experimental setbacks, iterating designs and refining algorithms to achieve optimal performance. They will cultivate flexible problem-solving approaches that consider real-world constraints and technical limitations. Balancing multiple research projects, coursework, and thesis deadlines will further enhance their ability to work under pressure.

Problem-solving and delivery skills are at the core of robotics engineering. Graduates will apply systematic methodologies such as design thinking and model-based engineering to solve complex robotics challenges. They will leverage data-driven decision-making, optimizing robot performance through sensor analysis, AI, and control theory. From conceptual design to prototype testing and real-world deployment, they will ensure that robotic systems are efficient, scalable, and reliable. By adhering to rigorous validation and testing standards, they will produce high-quality, reproducible research and technology solutions.

With Technological Agility, graduates will maintain proficiency in emerging robotics technologies, adapting quickly to new advancements in AI, automation, and hardware systems. They will gain hands-on experience with platforms such as ROS, Gazebo, V-REP, and OpenCV while developing strong programming skills in Python, C++, and MATLAB. Exposure to a wide range of robotic systems, including autonomous vehicles, humanoids, and drone technology, will prepare them for dynamic career opportunities.

Finally, graduates will develop an Entrepreneurial Mindset, enabling them to identify opportunities for commercialization and industry impact. They will gain business acumen by understanding robotics market trends, funding mechanisms, and commercialization strategies. By actively contributing to discussions on intellectual property, ethical considerations, and regulatory frameworks, they will ensure that robotics

technologies are developed and deployed responsibly.

By mastering these competencies, MSc Robotics and AI graduates will be well-prepared for careers in academia, research, and industry, contributing to cutting-edge advancements in robotics, AI, and automation.

b) Employability development

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Employability Services is committed to equipping postgraduate robotics students with the tools, support, and opportunities needed to thrive in their careers. Employability Services play a pivotal role in bridging the gap between academic excellence and professional success for MSc Robotics and AI graduates, empowering them to make a meaningful impact in a rapidly changing technological landscape.
The services provided are tailored to enhance employability and ensure industry readiness in a highly competitive field.

These include:

•Employability Skills and Training: Specialised workshops and training sessions designed to develop key employability competencies for MSc Robotics and AI students, such as project management, technical interview preparation, CV building, and advanced problem-solving. These sessions aim to refine both the technical and soft skills required for roles in robotics and related industries.

•Personalised 1:1 Support for Postgraduate Students: Dedicated career advisors provide tailored guidance to help robotics students navigate their career paths. From individual consultations on career goals and planning to identifying niche opportunities in automation, AI, and robotics sectors, students receive customised support to maximise their potential.

•Employer Engagement, Vacancy Sourcing, and Advocacy: Strong collaborations with leading robotics firms, start-ups, and global companies ensure that students have access to an extensive network of potential employers. Employability Services acts as an advocate for students by promoting their unique skills and qualifications to prospective organisations, while also sourcing exclusive opportunities tailored to their expertise in robotics, automation, and intelligent systems.

•Placement Administration: Full support is provided to streamline the process of securing placements, including assistance with applications,

networking, and administrative tasks. For MSc Robotics and AI students, placements are sourced with a focus on gaining experience in areas such as robotic system integration, automation solutions, and machine learning applications, enabling students to apply their academic knowledge in professional settings.

•Continuous Development Opportunities: Beyond graduation, Employability Services provides alumni with ongoing access to resources, networking opportunities, and career advice, ensuring they remain competitive and adaptable as technology and robotics industries evolve.

13 c) Placement and work experience opportunities

For MSc Robotics and AI with Professional Placement (15 months) / MSc Robotics and AI with Professional Placement (24 months) only

The MSc Robotics and AI programme offers structured professional placement opportunities to enhance students' practical learning and industry exposure. These placements are designed to complement the academic curriculum by providing real-world experience in robotics roles.

Students enrolled in the MSc Robotics and AI with Professional Placement (15 months or 24 months) have the opportunity to work with industry partners, enabling them to apply their academic knowledge to real-world challenges. During these placements, students engage in activities such as robotic system design, automation integration, machine learning applications, and digital twin development, mirroring the demands of cutting-edge robotics industries.

These placements allow students to:

•Gain hands-on experience: Work on real-world robotics projects in diverse sectors such as manufacturing, healthcare, autonomous vehicles, and aerospace, applying advanced technical knowledge to solve practical problems.

•Develop critical professional skills: Enhance essential skills such as problem-solving, project management, teamwork, and communication within multidisciplinary environments.
•Build industry networks: Establish valuable connections with robotics professionals, paving the way for future collaborations or employment opportunities.
•Understand global and ethical demands: Deepen their understanding of the global robotics market, with a focus on sustainable, ethical, and responsible applications of robotics technology.

These placements are fully supported by Employability Services and the programme team, who assist students in identifying relevant opportunities and provide personalised guidance throughout the placement period. Such experiences bridge the gap between academic study and professional practice, equipping MSc Robotics and AI graduates with the technical expertise, practical experience, and professional skills needed to excel in a competitive global robotics industry.

13d Future careers/progression

Graduates from the programme will be well-positioned to enter employment in roles requiring high-level expertise in robotics, automation, and robotic system design. With highly specialised practical skills in areas such as automated solutions, embedded systems, digital twins, and machine learning, graduates will meet the demands of a rapidly evolving global job market.

This expertise will open doors to careers in diverse sectors, including but not limited to:

•Manufacturing and Industry 4.0: Designing and implementing advanced robotics for smart factories, improving efficiency and productivity through automation and integration.

•Healthcare and MedTech: Developing surgical robots, rehabilitation

devices, and autonomous systems for elder care, which are transforming the healthcare landscape.

•Autonomous Systems and Transportation: Innovating in autonomous vehicles, drones, and transport systems, leveraging AI and sensor technologies to drive the future of mobility.

•Research and Development: Pushing the boundaries of robotics through advanced research in artificial intelligence, human-robot interaction, and swarm robotics at universities, labs, or private companies.

•Energy and Environmental Solutions: Designing robotics for sustainable energy management, environmental monitoring, or hazardous material handling, which are vital for a greener future.

Graduates will also have the potential to progress to senior engineering and leadership positions as their careers evolve, managing multidisciplinary teams and overseeing large-scale projects. Alternatively, the skills acquired will prepare them for entrepreneurial ventures, enabling them to develop innovative robotics startups or consultancy firms that address emerging global challenges.

For those seeking continued academic development, the programme will serve as an excellent foundation for pursuing a PhD or engaging in cutting-edge research in robotics and intelligent systems, contributing to scientific discovery and technological advancement.

By equipping graduates with a blend of theoretical knowledge, hands-on technical proficiency, and practical problem-solving capabilities, the programme ensures readiness for impactful careers in a robotics-driven world.

14. Assessment strategy

Students' knowledge and understanding is assessed by a combination of individual and team coursework, project work, reports and presentations.

Students' skills are assessed by a combination of individual and collaborative lab and other coursework, project work, including both software and hardware development, reports and presentations.

15. Programme structures –

MSc Robotics and AI

Year 1

Students must normally pass 180 credits at Level 7 to progress to Placement module

For the PGCert Robotics award students must successfully complete 60 credits which must include either PDE4330 – Mobile Robotics or PDE4435 Robotic Systems Integration.
For the PGDip Robotics award students must successfully complete 120 credits which must include either PDE4430 – Mobile Robotics or PDE4435 Robotic Systems Integration.

Year 1 Level 7 FT and PT

Code	Module Title	Credits	Type
PDE4431	Robot Manipulation	15	Compulsory
PDE4447	Intelligent Sensing and Motion Control	30	Compulsory
PDE4430	Mobile Robotics	15	Compulsory
PDE4444	Machine Learning for Engineers	15	Compulsory
PDE4443	Engineering Sustainability	15	Compulsory
PDE4435	Robotic Systems Integration	30	Compulsory
PDE4445	Individual Project	60	Compulsory (pass required)

Year 2

Year 2 Level 7 PT

Code	Module Title	Credits	Type
PDE 4447	Intelligent Sensing and Motion Control	30	Compulsory
PDE4435	Robotic Systems Integration	30	Compulsory
PDE4445	Individual Project	60	Compulsory (pass required)

MSc Robotics and AI with Professional Placement

Year 1

Year 1 Level 7 FT

Code	Module Title	Credits	Type
PDE4431	Robot Manipulation	15	Compulsory
PDE4447	Intelligent Sensing and Motion Control	30	Compulsory
PDE4430	Mobile Robotics	15	Compulsory
PDE4260	Preparing for the Professional Placement (week 6 onwards)		
PDE4444	Machine Learning for Engineers	15	Compulsory
PDE4443	Engineering Sustainability	15	Compulsory
PDE4435	Robotic Systems Integration	30	Compulsory
PDE4445	Individual Project	60	Compulsory (pass required)

Year 2

Year 2 Level 7

Code	Module Title	Credits	Type
PDE 4262	Postgraduate Professional Placement (extended) [0]	0	Optional
PDE4261	PDE4261 Postgraduate Professional Placement [0]	0	Optional

16. Progression requirements

The Accreditation of Higher Education Programmes (AHEP) outlines the purpose and application process for universities that wish to secure or maintain accreditation of their programmes. The terms M1, M2, M3, etc.,

on the Engineering Council's AHEP framework represent the specified learning outcomes and competency areas required for accreditation.

Middlesex University is a member of the Connected Curriculum Project organised by Siemens and Festo to link industry practices to the academic curriculum.

Middlesex University is also a member of GAMBICA, a trade organisation representing industry organisations in Automation, Control and Process Industries.

The department of Design Engineering and Mathematics is a member of the Engineering Professors Council (EPC) and SEFI (European Society for Engineering Education) and Women's Engineering Society (WES).

University regulations apply.

Postgraduate

Level 7: Students must normally pass 180 credits at Level 7 to progress to Placement module

Non-compensatory modules

- PDE4445 I Individual Project

17. Programme-specific support for learning

Meeting the learning outcomes of this programme requires active participation in the subject and the development of autonomous practice in meeting objectives. Supporting this level of active participation and autonomous practice is achieved via regular weekly drop-in sessions organised by the module tutors, productive and informed support from technical staff and the use of online, resource-based learning materials where appropriate. The subject provides extensive facilities where

students can engage with their coursework assignments in a supported and productive environment.

18. HECOS code (Hecos | HESA)

100170: Mechatronics and Robotics

19. Relevant QAA subject benchmarks

Computing 2022, Engineering 2023

20. University Regulations

The programme will run in line with general University Regulations. View the full Regulations: Policies | Middlesex University.

This programme will run in line with general University Regulations: Policies | Middlesex University

21. Reference points

•QAA: The Frameworks for Higher education Qualifications of UK Degree-Awarding Bodies, February 2024
•QAA Subject Benchmark Statements: Engineering, March 2023
•QAA Characteristic Statement Master's Degree, February 2020
•UK Standard for Professional Engineering Competence (UKSPEC)
•Middlesex University's Policy, Regulations and Guidelines
•Middlesex University's Learning and Quality Enhancement Handbook
•QAA The UK Quality Code for Higher Education, May 2023
•The Accreditation of Higher Education Programmes (AHEP), 2020
•Middlesex University policy on equal opportunities
•2031 Learning Framework principles, Middlesex University

21. Methods for evaluating and improving the quality and standards of learning

Refer to Middlesex Quality processes

22. Other information

Not applicable