



COURSE HANDBOOK

2026/2027

MSc Autonomous Robotics

This handbook applies to students starting the MSc Autonomous Robotics in October 2026.

The Examination Regulations relating to this course are available [here](#).

If there is a conflict between information in this handbook and the Examination Regulations, then you should follow the Examination Regulations. If you have any queries, please contact msc-robotics@eng.ox.ac.uk.

The information in this handbook is accurate as of 2 October 2026 however, it may be necessary to make changes in course provision.

MSc Autonomous Robotics
2026: version 1.1

For the latest version of this handbook, please see this [website](#)

Contents

1. Introduction.....	4
1.1 Important Dates and Course Timetable.....	6
1.1.1 2026-2027 Term and Assessment Dates.....	6
1.2 Key Contacts.....	7
1.3 Disability.....	8
1.4 Virtual Learning Environment	8
1.5 Online Presence, Virtual Meetings and Video Conferencing.....	8
1.6 Sources of information.....	8
2 Buildings and facilities.....	9
2.1 Engineering Science.....	9
2.2 University Libraries.....	9
Radcliffe Science library	9
3. Guidance in the event of an attack by an armed person or persons.....	10
4. Course content and structure	11
4.1 Course aims and learning outcomes	11
4.2 Course structure.....	12
5. Taught modules.....	12
5.1 Teaching and Learning	12
5.2 Assessment of taught modules	14
5.3 Online submission	14
5.4 Written Examinations.....	15
5.5 Provisional Marks and Feedback.....	15
6. Good academic practice and avoiding plagiarism.....	15
7. Study skills	15
8. Course feedback.....	16
9. Student representation	16
10. Complaints and Appeals.....	16
10.1 Complaints.....	16
10.2 Academic appeals.....	17
11. Harassment	17
12. Detailed Syllabus	18
12.1 Robotics Research Review (Michaelmas Term 2026)	18
12.2 Programming for Robotics (Michaelmas Term 2026)	19

12.3 Robotics Foundations (Michaelmas Term 2026)	20
12.4 Robotics Group Projects (Michaelmas Term 2026)	21
12.5 Robotics Project Proposal (Hilary Term 2027)	22
12.6 Autonomous Robotics Systems (Hilary Term 2027).....	23
12.7 Machine Learning for Robotics (Hilary Term 2027)	24
12.8 Robotics Group Project (Hilary Term 2026)	25

1. Introduction

We are delighted to welcome you to the MSc in Autonomous Robotics.

Robotics is advancing at an extraordinary pace. Autonomous systems are already changing the way we travel, work, manufacture, provide healthcare, explore challenging environments, and understand the world around us. As advances in artificial intelligence, sensing, computation, and engineering continue to come together, robots will become increasingly capable and increasingly present in our everyday lives. This creates enormous opportunities, but also important technical and societal challenges. The next generation of roboticists will have a vital role to play in shaping how these technologies develop and ensuring that they are useful, trustworthy, and responsible.

The University of Oxford, and the Oxford Robotics Institute (ORI) in particular, is recognised internationally as a leader in robotics. ORI brings together researchers working at the forefront of autonomous systems. Our research combines fundamental advances with the development and deployment of robotic systems in demanding real-world environments, supported by strong collaborations across the University and with industry. As an MSc student, you will be joining our active research community and learning from people who are helping to define the future of the field.

This course will equip you with the technical knowledge and problem-solving skills required to tackle challenging problems in robotics. Through our strong engagement with industry partners, you will gain exposure to real-world applications and the challenges involved in taking autonomous systems beyond the laboratory. We will provide opportunities to engage with practical case studies and ongoing research, helping you connect what you learn on the course with the wider robotics community and with future career opportunities.

Beyond technical expertise, the MSc will encourage you to think carefully about the ethical, societal, and regulatory implications of autonomous systems. Developing capable robots is only part of the challenge: understanding how they should operate safely and responsibly in society is equally important. We want you to leave Oxford equipped not only to contribute to advances in robotics, but also to help shape the role that robotics will play in the future.

We hope that you will be very happy at the University of Oxford, and that you will flourish academically and personally during your time here. The collegiate University provides a diverse range of opportunities to learn new skills, meet new people, and explore new ideas, and we encourage you to make the most of what Oxford has to offer. We also hope that you will become active members of the robotics community, engaging with the many seminars, events, activities, and conversations taking place throughout the year.

We look forward to working with you and to seeing what you will achieve during your time on the MSc.

Professor Ioannis Havoutis

Course Director

Professor Perla Maiolino

Deputy Course Director

Professor Digby Chappell

Deputy Course Director

1.1 Important Dates and Course Timetable

Course Timetable AY26-27

Term	Courses	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Long Vacation
Michaelmas Term	Module 1: Robotics Research Review (PM)	Induction					2hr tutorial	2hr tutorial	2hr tutorial	2hr tutorial	
	Module 2: Programming for Robotics. (NH/MF)	Induction	4hr Lectures 4hr Labs	4hr Lectures 4hr Labs	4hr Lectures 4hr Labs	4hr Lectures 4hr Labs				ASSESSMENT	
	Module 3: Robotics Foundations (IH/PM)	Induction	4hr Lectures 4 hr Labs	6hr Lectures 4hr Labs	6hr Lectures						
	Module 4: Robotics Group Projects (DC/IH/RS)	Induction					Group Work 4hr guided labs 4hr supervised work	Group Work 4hr guided labs 4hr supervised work	Group Work 4hr guided labs 4hr supervised work	Group Work 2hr guided lab session 2hr tutorial ASSESSMENT	
Hilary Term	Module 5: Robotics Project Proposal (OP)		Dissertation projects released			Dissertation projects assigned/confirmed	2hr tutorial	2hr tutorial	2hr tutorial	2hr tutorial	
	Module 6: Autonomous Robotics Systems. (MF/DD)		4hr Lectures 4hr Labs	4hr Lectures 4hr Labs	4hr Lectures 4hr Labs	4hr Lectures 4hr Labs					
	Module 7: Machine Learning for Robotics. (OP)		4hr Lectures 4hr Labs	4hr Lectures 4hr Labs	4hr Lectures 4hr Labs	4hr Lectures 4hr Labs					
	Module 8: Robotics Group Projects (DC/DD/NH)						Group Work 4hr guided labs 4hr supervised work	Group Work 4hr guided labs 4hr supervised work	Group Work 4hr guided labs 4hr supervised work	Group Work 2hr guided lab session 2hr tutorial ASSESSMENT	
Trinity Term and Long Vacation		Dissertation 40 page submission due Noon on First Tuesday of September									ASSESSMENT: Dissertation (submission) Noon First Tuesday of September
	EXAMS								ASSESSMENT: Exams for Modules 3 and 6		

All teaching and lab work to take place in OERC space

1.1.1 2026-2027 Term and Assessment Dates

Important Term and Assessment Dates for Handbook		
Monday 5 October 2026	MT Week 0	Departmental Induction
Sunday 11 October 2026	MT Week 1	Start of Michaelmas Term
Friday 6 November 2026	MT Week 4	Module 2: Programming for Robotics Assessment
Wednesday 2 December 2026	MT Week 8	Module 1: Robotics Research Review Assessment
Wednesday 2 December 2026	MT Week 8	Module 4: Robotics group Project Assessment
Saturday 5 December 2026	MT Week 8	End of Michaelmas Term
Sunday 17 January 2027	HT Week 1	Start of Hilary Term
Friday 12 February 2027	HT Week 4	Module 7: Machine Learning for Robotics: Assessment
Wednesday 10 March 2026	HT Week 8	Module 5: Robotics Project Proposal Assessment
Wednesday 10 March 2026	HT Week 8	Module 8: Robotics group Project Assessment

Saturday 13 March 2027	HT Week 8	End of Hilary Term
Sunday 25 April 2027	TT Week 1	Start of Trinity Term
Date TBC	TT Week TBC	Module 3: Robotics Foundations Exam
Date TBC	TT Week TBC	Module 6: Autonomous Robotics Systems Exam
Saturday 19 June 2027	TT Week 8	End of Trinity Term
Tuesday 7 September 2027		Dissertation Submission Deadline

1.2 Key Contacts

Course Directors: director-roboticsmsc@eng.ox.ac.uk

Prof. Ioannis Havoutis

Prof. Perla Maiolino

Prof. Digby Chappell

Course Administrator: msc-robotics@eng.ox.ac.uk

Anniella Hutchinson

MSc Engineer: luke.pitt@eng.ox.ac.uk

Luke Pitt

Engineering Science IT Helpdesk: <https://thehub.eng.ox.ac.uk>

1.3 Disability

If you have any form of disability, we strongly encourage you to disclose this to the Department's Disability Lead and Head of Student Administration in Engineering Science, Phil Bolton (phil.bolton@eng.ox.ac.uk), so that we can make provision for you. Your college will advise you of your Disability Contact, who will be pleased to talk to you in the strictest confidence.

Students with a disability may also find useful advice and guidance on the University of Oxford Disability Office web page: www.ox.ac.uk/students/welfare/disability.

1.4 Virtual Learning Environment

This course uses Canvas, a web-based Virtual Learning Environment (VLE), to deliver information on the course's modules.

- Induction materials
- Reading lists for each module
- Hand-outs and presentations from modules
- Links to resources on academic good practice and study skills
- Forums - for tutor-student and student-student interaction

You can log onto Canvas using your Single Sign-On (SSO) at <https://canvas.ox.ac.uk/>. If you are unable to access Canvas, please email the course administrator with details of your SSO.

1.5 Online Presence, Virtual Meetings and Video Conferencing

Students are expected to attend all teaching sessions in person. Where necessary, we will use MS Teams to enable speakers to present remotely.

1.6 Sources of information

[The University Student Handbook](#) provides general information and guidance on making the most of the opportunities on offer at the University of Oxford. It also explains the University's codes, regulations, policies and procedures.

The [Oxford Students](#) website provides a single point of access to information, services and resources for students.

The [Student Self Service portal](#) enables you to register, view and update your personal and academic information throughout your studies at Oxford. You must complete your annual registration at the start of your course and each successive year.

The Graduate Supervision Reporting system allows you and your supervisor to record and review your progress. You can access the GSR system via the [Student Self Service portal](#).

2 Buildings and facilities

2.1 Engineering Science

MSc Teaching Space, OeRC

All teaching will take place in the MSc Teaching Space at Oxford e-Research Centre (OeRC), Keble Road, Oxford, OX1 3QG which will be open from 08H00 to 17H30, Monday to Friday.

Staff from the ORI engineering team will be on hand to support the equipment and teaching in the OeRC.

Engineering Science Departmental Student Study Space, Thom Building, Parks Road

An open study area with Wi-Fi is available for all engineering students to use on the eighth floor in the Thom Building. There are tables for individual and group study, and individual study carrels. Students are welcome to use their laptops in the open study area but are asked to sit close to a plug socket if their laptop needs to be connected to a power source. Trailing electrical leads may cause a trip hazard in open study areas. Students are asked to vacate the eighth-floor study area promptly at 7:00pm. Please note that you will not be able to gain access to the Thom Building after 6:00pm. If you leave the building after 6:00pm you will not be able to gain access again so, please keep your personal belongings with you at all times.

ORI, The George Building

The main building for the Oxford Robotics Institute and where most of the academic team, administrative team and the batlab are located. You will be welcome to join the fortnightly caketime social get together in this kitchen of the ORI.

2.2 University Libraries

Radcliffe Science library

The Radcliffe Science Library (RSL) (www.bodleian.ox.ac.uk/science) is the main science research library at the university. The library holds copies of the course's reading list items, and most research will be undertaken using this library's resources. The RSL is located a short walk away from the Engineering Science department on South Parks Road.

The Subject Librarian responsible for Engineering Science is Alessandra Vetrugno (alessandra.vetrugno@bodleian.ox.ac.uk), who is based at the RSL.

3. Guidance in the event of an attack by an armed person or persons

1. Be prepared and stay calm

The purpose of this guidance is to alert and not to alarm – it is not being provided in response to any specific information. Although students are asked to be mindful and alert, please do not be overly concerned. You are asked to carry on with your day-to-day life as normal.

In the event of an incident, quickly determine the best way to protect yourself.

2. Evacuate

- If it is possible to do so safely, exit the building or area immediately
- Have an escape route in mind (Fire Exit signs are a good point of reference)
- Evacuate regardless of whether others agree to follow
- Help others, if possible
- Prevent others from entering the area of danger
- Do not attempt to move wounded people
- When you are safe, call 999 and ask for the police

3. Hide

- If evacuation is not possible, find a place to hide where the offender is less likely to find you
- If you are in a room/office, stay there
- If you are in a corridor, get into a room/office
- Lock the door and blockade it with furniture
- Silence your mobile phone and remain quiet
- Turn off the lights and draw any blinds
- Hide out of view and behind something solid (desk or cabinet)
- If it is possible to do so safely, call 999 and ask for the police

4. Inform

If you contact the police, provide the following information:

- Location of and the number of offenders
- Any physical descriptions of the offenders
- Number and type of weapons used by the offenders
- Number and potential victims at the location
- Your location

Stay Safe

Further information and advice are available from Oxford University Security Services (telephone 01865 (2)72944 or email: security.control@admin.ox.ac.uk).

4. Course content and structure

Course Timetable AY26-27

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4.1 Course aims and learning outcomes

The course is designed to be studied full-time to those who have a first degree in engineering (including computer science and informatics), physical sciences or a mathematical subject. The program emphasizes both research and hands-on training, allowing students to analyse real-world robotics use-cases and design integrated autonomous systems.

The MSc in Autonomous Robotics Aims to:

- Provide students with a deep understanding of the fundamental principles of robotics, including perception, planning, control, and artificial intelligence.
- Develop expertise in designing, implementing, and testing autonomous robotic systems across different applications and environments.
- Train students in modern robotics programming frameworks, including simulation and real-world deployment.
- Equip students with the ability to critically evaluate research literature, apply advanced mathematical and computational methods, and design innovative solutions to robotics challenges.

- Foster an interdisciplinary approach by integrating knowledge from engineering, computer science, artificial intelligence, and cognitive science.
- Prepare students for further research (e.g., DPhil/PhD) or professional careers in robotics-related industries, with an emphasis on problem-solving, creativity, and ethical considerations.

4.2 Course structure

The MSc Autonomous Robotics is designed to be studied full time, and students will be required to complete the full set of the offered courses and an individual dissertation.

Candidates will complete and be assessed on the following parts:

1. Written examinations in the following core modules:
 - Robotics Foundations
 - Autonomous Robotics Systems
2. Submission of coursework assignments, which will take the form of an essay, report, poster, video or other presentation format in each of the following core modules:
 - Robotics Research Review
 - Programming for Robotics
 - Robotics Project Proposal
 - Machine Learning for Robotics
3. A group project in each of Michaelmas and Hilary terms
4. A dissertation of no more than 40 pages, completed independently under the guidance of an expert supervisor, on a topic of your choice and approved by the supervisor and MSc Course Director.

The programme is at level 7 in the Framework for Higher Education Qualifications (England, Wales and Northern Ireland)¹, which means it is equivalent to Masters Level. It meets the subject benchmark statement for Engineering at Masters Level, published by the Quality Assurance agency.²

5. Taught modules

5.1 Teaching and Learning

All teaching and assessments are solely standalone to this programme and are balanced across Lectures, Lab and practical work as well as group and an individual project.

Lectures

Lectures form the backbone of the theoretical framework for the course. They provide structured content delivery by subject matter experts from the Oxford Robotics Institute. Lectures cover key

¹ <https://www.qaa.ac.uk/docs/qaa/quality-code/uk-quality-code-for-higher-education-2024.pdf>

² <https://www.qaa.ac.uk/docs/qaa/sbs/sbs-engineering-23.pdf>

topics such as machine learning, control systems, state estimation, and the ethical implications of autonomous robots.

MT: Lectures in the first term introduce core concepts in programming, robotics fundamentals, and autonomous systems.

HT: Lectures shift towards advanced topics, such as machine learning for robotics and mobile autonomy, while also incorporating practical elements.

TT & LV: No lectures, as students transition to independent research and dissertation work.

Laboratory and Practical Work

Hands-on experience is fundamental in robotics education. The course incorporates laboratory sessions that allow students to work directly with hardware and software, ensuring that they develop essential skills in designing, programming, and testing autonomous systems.

MT & HT: Weekly lab sessions focus on practical implementation of theoretical concepts, including robot programming, algorithm implementation and hands-on robot work with hardware.

Group and Individual Projects

Project-based learning is integral to the MSc, with both group and individual projects embedded throughout the program.

Group Projects (MT & HT): These projects enhance teamwork skills and encourage interdisciplinary collaboration. Students work on real-world problems, potentially in partnership with industry stakeholders.

Individual Research Project (TT & LV): The dissertation forms the culmination of the MSc, where students apply their acquired knowledge to an in-depth study under academic supervision.

All modules of the course must be completed by all students, and module descriptions can be found in Appendix 1.

All teaching will be held in the dedicated teaching space in the OeRC on Keble Road. Space for independent study and collaborative working in groups will be available within the Department of Engineering Science on the 8th floor of the Thom Building next to the Student Administration offices.

5.2 Assessment of taught modules

The taught module assessments combined contribute 50% of the overall marks for the degree.

Students must attend and submit assessments for **all** taught modules. All module marks are taken by the Board of Examiners to contribute towards your overall degree.

Each taught module will be followed by an assessment. Assessments may take different forms: written essay-type questions, consultant style reports and worked problems, video presentations or poster designs. The form of the assignment being chosen by the module leader may not be consistent year by year.

Each module assessment with online submission will be distributed during the module onto Inspira. Students will submit the assessments electronically through Inspira, the University's secure submissions portal.

5.3 Online submission

During the course you will be required to submit work through Inspira, a secure submissions portal, which you can access using your SSO at <https://oxford.inspera.com/>. **You must** submit your assignments online using Inspira by the date specified on the assessment question paper. As part of your online submission, you are required to submit a declaration of authorship, confirming that the work you are submitting is your own. You should keep copies of all submitted work.

All submitted written assignments must include a word count on the title page. Where applicable, students should also indicate their observance of other limitations and requirements (for example, the running time of a video presentation should be stated, along with the time limit stipulated in the assignment question paper).

There are penalties for work submitted late without prior agreement. Details are set out in Section 3.6 of the course's Examination Conventions.

If you submit your work late, or do not expect to be able to meet a forthcoming deadline, the University Students website provides a helpful [guide](#) that explains the steps to take.

If you are unsure about any element of the procedure for submitting your work, or are encountering difficulty submitting your work, please contact the MSc Programmes Administrator.

Please refer to the course's Examination Conventions [linked from the course Canvas page] for procedures relating to assignment resubmission.

5.4 Written Examinations

You can expect the examinations for the MSc to be held in the Examinations Schools on the High Street. The location of your examinations will be confirmed on your timetable. Please look at the screens in the foyer to find out in which room your exam is going to be sat. You must wear full academic dress (sub fusc, gown and mortar board/cap) to attend public examinations, and you must bring your University card and your own stationery with you.

5.5 Provisional Marks and Feedback

Six weeks after the assignment deadline, you will receive a provisional mark and qualitative feedback from the assessors. Please note that these marks will remain provisional until approved by the final Board of Examiners meeting.

Marks and feedback for each assignment will be uploaded to each student's private SharePoint folder. The MSc Programmes Administrator will send you an access link.

6. Good academic practice and avoiding plagiarism

Plagiarism is presenting someone else's work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition. Plagiarism may be intentional or reckless, or unintentional. Under the regulations for examinations, intentional or reckless plagiarism is a disciplinary offence. Please review the Oxford Student's website [guidance](#) on plagiarism:

Each student is **required** to complete the [Avoiding Plagiarism course](#) and gain the associated certificate. Once completed, students should send proof of their certification to the course administrator.

The course will be following guidelines published <https://www.ox.ac.uk/about/how-we-are-run/policies-and-statements/policy-hub/ai-use-in-summative-assessment> on the use of Generative AI in assessment.

All dissertations will be screened by Turnitin software which will assess submissions against published and unpublished sources and the work of other students. Assignments from the taught modules may also be screened in the same way. Examiners will be notified of the extent of any textual matches discovered by Turnitin and will consider whether any text has been properly identified and referenced.

The Examination Conventions set out the academic penalties for (a) intentional or reckless plagiarism, and (b) poor academic practice.

7. Study skills

Guidance on time management, note-taking, referencing, research and library skills and information is available [here](#).

8. Course feedback

At the end of each taught module, students will be asked to provide feedback via an anonymous survey. It is very important that students complete this survey to help us monitor teaching quality and to make necessary adjustments or improvements.

In December, all students at Oxford will also be asked to complete the Student Barometer, which monitors the quality of all aspects of the student experience.

9. Student representation

Oversight of the course is managed by a Standing Committee, which meets three times a year. These meetings are attended by the student representative, selected by the cohort for each year. One representative will also attend the termly departmental Graduate Joint Consultative Committee (GJCC).

10. Complaints and Appeals

The University, MPLS Division and the Department of Engineering Science hope that provision made for students at all stages of their course of study will make the need for complaints (about that provision) or appeals (against the outcomes of any form of assessment) infrequent.

Nothing in the University's complaints procedure precludes an informal discussion with the person immediately responsible for the issue that you wish to complain about (and who may not be one of the individuals identified below). This is often the simplest way to achieve a satisfactory resolution.

Many sources of advice are available within colleges, within faculties/departments and from bodies such as the Student Advice Service provided by OUSU or the Counselling Service, which have extensive experience in advising students. You may wish to take advice from one of these sources before pursuing a complaint.

General areas of concern about provision affecting students should be raised through Joint Consultative Committees or via student representation on the faculty/department's committees.

10.1 Complaints

Concerns or complaints relating to teaching or other provision made by the faculty/department should be raised with one of the Course Directors (Prof Ioannis Havoutis, Prof Perla Maiolino, Prof Digby Chappell), or Director of Graduate Studies (Professor Felix Hofmann) as appropriate. Within the faculty/department, the officer concerned will attempt to resolve the concern/complaint informally.

Student concerns can be taken further by making a formal complaint to the University Proctors. The procedures adopted by the Proctors for the consideration of complaints and appeals are described on the Proctors' webpage ([Academic appeals, complaints and conduct](#)) and the [Student Handbook](#).

If a concern or complaint relates to teaching or other provision of a college, it should be raised either with the college tutor or with one of the college officers, a Senior Tutor, or Tutor for Graduates (as appropriate). The college will also be able to explain how to take a complaint further if a student is dissatisfied with the outcome of its consideration.

10.2 Academic appeals

An academic appeal is defined as a formal questioning of a decision on an academic matter made by the responsible academic body.

A concern which might lead to an appeal should be raised with the college authorities and the individual responsible for overseeing a student's work. It must not be raised directly with examiners or assessors. If it is not possible to resolve a concern in this way, it may be put in writing and submitted to the Proctors via the Senior Tutor of the relevant college.

As noted above, the procedures adopted by the Proctors in relation to complaints and appeals can be found via the following:

- Proctors' webpage (<https://www.ox.ac.uk/students/academic/complaints>)
- Student Handbook (<https://www.ox.ac.uk/students/academic/student-handbook?wssl=1>)

In relation to academic appeals, please note that:

- The Proctors are not empowered to challenge the academic judgement of examiners or academic bodies.
- The Proctors can consider whether the procedures for reaching an academic decision were properly followed; i.e., whether there was a significant procedural administrative error; whether there is evidence of bias or inadequate assessment; whether the examiners failed to take into account special factors affecting a candidate's performance.
- On no account should a student attempt to contact examiners or assessors directly.

11. Harassment

The University condemns harassment as an unacceptable form of behaviour and has an advisory system to help people who think they are being harassed. Harassment includes any unwarranted behaviour directed towards another person which disrupts that person's work or reduces their quality of life. Further information and guidance are available at:

- [Supporting Students at Oxford: preventing and responding to harassment and sexual misconduct | Oxford University](#)

The Engineering Science department has a team of bullying and harassment advisors who can provide confidential support and guidance to students, these including phil.bolton@eng.ox.ac.uk

12. Detailed Syllabus

12.1 Robotics Research Review (Michaelmas Term 2026 – Module 1)

Course Context

This module develops students' ability to enter a new robotics research area by discovering, evaluating and synthesising the scientific literature. Students undertake an individual state-of-the-art review on a topic among several proposed covering different field of robotics research. Through short lectures, guided paper discussions and workshop activities, students learn the scientific research process, literature discovery, critical evaluation of robotics papers, comparison of competing approaches, identification of research gaps and communication of their findings. The majority of the contact time is devoted to supervised individual work with formative feedback.

Course Overview

8hrs Lectures

24 Self-study hours

Lecturers

Prof. Robert Bains (Department of Engineering Science)

Module synthesis

Students will be able to discover and critically evaluate robotics literature, understand the evolution of a research field, compare competing methods, identify research gaps and communicate the current state of the art through written and oral presentation.

Assessment

Assessment focuses on critical analysis, synthesis and evidence-based interpretation rather than descriptive summaries.

The assessment consists of three connected components. The Literature Matrix (40%) demonstrates how carefully students read and compare individual papers. The Research Field Exploration Record (35%) demonstrates how students searched, selected and mapped the field. The oral presentation (25%) demonstrates whether the student can communicate and defend the resulting field-level understanding. The three components should be consistent, but each provides different evidence of the work.

Presentations will be delivered AM Monday Week 8. Submission of Literature Matrix and Research Field Exploration record is at noon Wednesday Week 8

Course Texts

Slides provided by the Lecturer

Required Pre-Reading (Recommended)

S. Keshav. 2007. How to read a paper. SIGCOMM Comput. Commun. Rev. 37, 3 (July 2007), 83–84.
<https://doi.org/10.1145/1273445.1273458>

Marco Pautasso (2013), “Ten Simple Rules for Writing a Literature Review”.

Example of a published robotics review: Wang, H., Totaro, M. and Beccai, L. (2018), “Toward Perceptive Soft Robots: Progress and Challenges”.

12.2 Programming for Robotics (Michaelmas Term 2026 – Module 2)

Course Context

This course will introduce students to software tools that are widely used in the robotics community. We will work on simulation, middleware, deployment code, as well as good software development practices.

Course Overview

16hrs lectures

16hrs tutor-guided labs

16hrs self-guided labs

Lecturers

Prof. Nick Hawes (Department of Engineering Science)

Prof. Maurice Fallon (Department of Engineering Science)

Assessment

Assessed lab exercises each week

Group Challenge/presentation/Assessed exercise – Friday week 4 MT26

Course Texts

Ben-Ari, Principles of Concurrent and Distributed Programming, 2nd ed. (Addison-Wesley, 2006)

Optional:

Martín Rico, A Concise Introduction to Robot Programming with ROS 2, 2nd ed. (Routledge, 2024)

Required Pre-Reading (Recommended)

We expect all students to be comfortable programming in both C++ and Python. If you need to get up to speed with these languages, we recommend:

- Python Crash Course, A Hands-On, Project-Based Introduction to Programming by Eric Matthes
- Accelerated C++: Practical Programming by Example by Andrew Koenig and Barbara E Moo

There are many other books and online courses which you may prefer depending on your prior experience, so feel free to choose alternatives if needed.

12.3 Robotics Foundations (Michaelmas Term 2026 – Module 3)

Course Context

This course bridges the mathematical foundations of classical robotics with the engineering principles underlying modern robotic and soft robotic systems. Building on concepts such as kinematics, dynamics, motion planning, and trajectory generation, the course explores how these models are implemented through robot architecture, mechatronic components, sensing, actuation, control, and physical interaction. The final part of the course introduces compliant and soft robotics, highlighting how new materials and actuation technologies extend the capabilities of conventional rigid robots.

The course provides students with a systems-level understanding of the design, control, and interaction of contemporary robotic platforms and is organised into four thematic weeks. **Week 1** introduces the mathematical description of robotic manipulators through coordinate frames, rigid body motion, forward kinematics, and Jacobians. **Week 2** focuses on motion generation, covering inverse kinematics, robot dynamics, motion planning, and trajectory generation. **Week 3** examines the implementation of robotic systems, including robot motion architecture, mechatronic components, motion and force control, and physical interaction. **Week 4** extends these concepts to compliant and soft robotic systems, introducing their principles, sensing and actuation technologies, modelling, design, and control.

Course Overview

16hrs Lectures

8hrs Guided labs

64hrs Self-study

Lecturers

Prof Ioannis Havoutis (Department of Engineering Science)

Prof Perla Maiolino (Department of Engineering Science)

Assessment

Exam questions in Trinity Term 2027

Course Texts

- Foundations of Robotics. Bruno Siciliano, Luigi Villani, Giuseppe Oriolo, Alessandro De Luca

Soft Robotics, Cecilia Laschi

Required Pre-Reading (Recommended)

- Albu-Schäffer et al. (2007), "The DLR Lightweight Robot—Design and Control Concepts for Robots in Human Environments"
- Rus and Tolley (2015), "Design, Fabrication and Control of Soft Robots".

12.4 Robotics Group Projects (Michaelmas Term 2026 – Module 4)

Course Context

This is a high-intensity, practical project module designed to bridge the gap between theoretical robotics and real-world systems integration. Students work in instructor-assigned teams of 4–5 to solve complex engineering challenges that require hardware negotiation, software robustness, and effective group coordination. The module mimics professional robotics R&D environments, emphasising the "integration hell" of bringing disparate components into a single functional system.

Course Overview

16hrs Classes

16hrs Supervised sessions

80hrs Self-study

Lecturers

Prof. Digby Chappell (Department of Engineering Science)

Prof. Ioannis Havoutis (Department of Engineering Science)

Prof. Robert Skilton (Department of Engineering Science)

Course Content and Structure

The module runs twice: once in Michaelmas Term (Project Alpha) and once in Hilary Term (Project Beta). Students will be assigned to a different project in each term to ensure exposure to different domains.

Project Alpha: Nuclear Decommissioning

Remote manipulation within a glovebox environment. Focuses on high-precision grasping and reachability in constrained environments.

Week 5 – Project Kick-off: Group formation and hardware familiarization.

Week 6 – Design and Prototyping: Developing the core teleoperation control architecture and sensor processing pipelines.

Week 7 – Integration and Testing: Integrating control and sensing. Extensive debugging and system stress testing to develop operator manipulation strategies

Week 8 – The Challenge and Final Delivery: Final optimisation and preparation for the Competition.

Module synthesis

This module synthesises skills from robotic fundamentals, control, vision, and robot manipulation into a unified bimanual teleoperation system. It challenges students to move beyond idealised simulations and models of robots into the reality of hardware limitations, real-time computation constraints, and environmental complexity. By the end of the module, students will have a portfolio-ready group project and a deep understanding of robot teleoperation for bimanual manipulation.

Assessment

Group Presentation and Demonstration (50%):

- Challenge Performance (20%)
- Presentation (30%)

Individual Written Report (50%):

- Final Report (30%)
- Teamwork and Individual Contributions (10%)
- Code Review (10%)

Challenge Date: AM Tuesday, 8th Week

Submission Deadline: noon Friday, 8th week

Course Texts

N/A

Required Pre-Reading (Recommended)

N/A

12.5 Robotics Project Proposal (Hilary Term 2027 – Module 5)

Course Context

This module develops students' ability to propose a robotics-centred research project by framing the project motivation, identifying project milestones and deliverables, planning resources, and examining the wider impact and follow-on research generated by the project. Students will prepare an individual proposal for their dissertation project starting in Trinity Term. The module will take the form of short lectures, guided discussions and workshop activities.

Course Overview

8hrs Lectures

24 Self-study hours

Lecturers

Dr Oiwi Parker Jones (Department of Engineering Science)

Assessment

Submission of Project Proposal and Project Planning Chart
Individual Presentations

Course Texts

N/A

Required Pre-Reading (Recommended)

Denscombe, Martyn. Research proposals: A practical guide: A practical guide. McGraw-Hill Education (UK), 2012.

12.6 Autonomous Robotics Systems (Hilary Term 2027 - Module 6)

Course Summary

This module covers probabilistic state estimation and SLAM for mobile robots, with an emphasis on practical implementation and evaluation on real sensors (cameras, LiDAR, IMU). Lectures develop the theoretical foundations (Bayes filters, EKF, particle filters, ICP, graph-based SLAM, multiview geometry), and labs give hands-on experience in recording, processing, and integrating sensor data, and in running SLAM pipelines on real hardware. The course is built to move students from mathematical models to robust, engineering-quality systems.

Course Overview

16hrs Lectures

16hrs tutor-guided labs

16hrs self-guided labs

Lecturers

Prof. Maurice Fallon (Department of Engineering Science)

Prof. Daniele De Martini (Department of Engineering Science)

Assessment

Examination in Trinity Term

Course Texts

“SLAM Handbook. From Localization and Mapping to Spatial Intelligence”. Luca Carlone, Ayoun Kim, Timothy Barfoot, Daniel Cremers and Frank Dellaert. Cambridge University Press. 2026. Pre-print PDF available online here:

<https://github.com/SLAM-Handbook-contributors/slam-handbook-public-release>

“Probabilistic Robotics”. Sebastian Thrun, Wolfram Burgard and Dieter Fox. The MIT Press. 2005.

“Robotics, Vision and Control: Fundamental Algorithms in Python”. Peter Corke. Springer. 2023.

Required Pre-Reading (Recommended)

We expect all student to be generally familiar with the sensors used in robotic navigation (cameras, lidars, sonars, radar, IMUs etc). Ideally pre-reading would be Part 1 of the SLAM Handbook plus Chapter 7 and Chapter 8 on Visual SLAM and LiDAR SLAM.

12.7 Machine Learning for Robotics (Hilary Term 2027 - Module 7)

Course Context

This module introduces machine learning for robotics, spanning supervised learning, deep learning, computer vision, reinforcement learning, probabilistic machine learning, and deep generative models. Lectures develop the theoretical foundations of learning from data, perception, decision making, control, uncertainty, representation learning, and generative modelling, while laboratories provide hands-on experience applying these techniques to robotics problems. The course progressively builds from robot modelling and visual perception, through autonomous policy learning and control, to probabilistic inference, latent representation learning, and models for prediction and planning in robotic systems.

Course Overview

16hrs Lectures

16hrs Guided labs

40hrs Self-study

Lecturers

Dr Oiwi Parker Jones (Department of Engineering Science)

Prof Robert Skilton (Department of Engineering Science)

Assessment

Assessed lab exercises each week

Final exercise-based assessment – Friday week 4 HT26

Course Texts

Bishop, C. M. – Pattern Recognition and Machine Learning (PRML)

A classic machine learning text covering the theory and practice of regression, classification, neural networks, and probabilistic learning.

Sutton, R. S. & Barto, A. G. – Reinforcement Learning: An Introduction (2nd Edition)

The definitive introduction to reinforcement learning, covering the fundamental algorithms and concepts that underpin modern reinforcement learning methods.

Required Pre-Reading (Recommended)

For Part 1: Deep Learning and Reinforcement Learning for Robotics

12.8 Robotics Group Project (Hilary Term 2026 - Module 8)

Course Context

This is a high-intensity, practical project module designed to bridge the gap between theoretical robotics and real-world systems integration. Students work in instructor-assigned teams of 4–5 to solve complex engineering challenges that require hardware negotiation, software robustness, and effective group coordination. The module mimics professional robotics R&D environments, emphasising the "integration hell" of bringing disparate components into a single functional system.

Course Overview

16hrs Classes

14hrs Supervised sessions

80hrs Self-study

Lecturers

Prof. Daniele De Martini (Department of Engineering Science)

Prof. Nick Hawes (Department of Engineering Science)

Prof. Digby Chappell (Department of Engineering Science)

Course Content and Structure

The module runs twice: once in Michaelmas Term (Project Alpha) and once in Hilary Term (Project Beta). Students will be assigned to a different project in each term to ensure exposure to different do

mains.

Project Beta: Autonomous Urban Mobility

A multi-robot coordination problem using Robotaxis in a Duckietown environment. Focuses on coordination, traffic logic, and vision-based navigation.

Week 5 – Project Kick-off: Group formation and hardware familiarisation. Infrastructure setup (ROS/ISAAC).

Week 6 – Design and Prototyping: Developing the core control architecture and sensor processing pipelines.

Week 7 – Integration and Testing: Dealing with hardware edge cases and software integration. Extensive debugging and system stress testing

Week 8 -- The Challenge and Final Delivery: Final optimisation and preparation for the Competition

Module synthesis

This module synthesises skills from vision, control, and planning into a unified system. It forces students to move beyond idealised simulations into the reality of hardware failures and real-time computation constraints. By the end of the module, students will have a portfolio-ready group project and a deep understanding of the full robotics lifecycle.

Assessment

Assessment is individual-based, derived from team-wise submissions and observed and recorded contributions.

Group Presentation and Demonstration (50%):

- Challenge Performance (20%)
- Presentation (30%)

Individual Written Report (50%):

- Final Report (30%)
- Teamwork and Individual Contributions (10%)
- Code Review (10%)

Challenge Date: AM Tuesday, 8th week

Submission Deadline: noon Friday, 8th week

Course Texts

N/A

Required Pre-Reading (Recommended)

N/A