# MTRN6060

## Robotics and Automation

Session 2, In person-scheduled-weekday, North Ryde 2026

*School of Engineering*

## Contents

# General Information

Unit convenor and teaching staff
Lecturer
Mohsen Asadnia
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9 Wally's Walk Room 320
Wednesday 1 pm-3 pm

Credit points
10

Prerequisites

Corequisites

Co-badged status

Unit description

In this unit, you will explore the principles and practice of industrial robotics and automation, developing the knowledge and skills needed to design and control robotic systems used in modern industry. You will build an understanding of how mathematical models underpin robot motion, sensing, and control, and how these foundations support real-world robotic applications.

You will learn to describe spatial relationships, perform coordinate transformations, and analyse the kinematics and dynamics of industrial robots. Using this knowledge, you will engage with the end-to-end design process for robotic systems and gain hands-on experience programming robots to perform purposeful, repetitive tasks. You will also apply a range of control techniques to automate processes representative of contemporary industrial practice.

Learning in this unit is project-based and experiential, allowing you to integrate theory with practice as you design, program, and control robotic and automated systems. This unit provides a foundation for further study in robotics and automation and supports career pathways in mechatronics, manufacturing, and industrial automation.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

# Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** Compute coordinates' spatial descriptions and transformations

**ULO2:** Compute an industrial robot's kinematics and dynamics

**ULO3:** Describe an industrial robot's design process

**ULO4:** Write a program to complete a relevant task by the robot

**ULO5:** Use different control techniques for an industrial robot to automate a relevant task

# General Assessment Information

## General Assessment Information

**Grading and passing requirement for unit**

In order to pass this unit a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD), and meet two hurdle requirments (below).

**Supplementary Exam:** If you receive special consideration for the final exam, a supplementary exam will be scheduled by the faculty during a supplementary exam period. This is typically 3 to 4 weeks after the normal exam period. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

**Late Assessment Submission Penalty**

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7$^{th}$ day (including weekends). After the 7$^{th}$ day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is **11:55 pm**. A 1-hour grace period will be provided to students who experience technical concerns. For any late submission of time-sensitive tasks, such as scheduled tests/ exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration. For example, if the assignment is worth 8 marks (of the entire unit) and your submission is late by 19 hours (or 23 hours 59 minutes 59 seconds), 0.4 marks (5% of 8 marks) will be deducted. If your submission is late by 24 hours (or 47 hours 59 minutes 59 seconds), 0.8 marks (10% of 8 marks) will be deducted, and so on.

**Assessments where Late Submissions will be accepted**

Minor Project- Yes, Standard Late Penalty applies

Major Project- NO, unless Special Consideration is Granted

Resubmissions of work are not allowed.

**Special Consideration**

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and

which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au.

Assessment Tasks

| Name | Weighting | Hurdle | Due | Groupwork/ Individual | Short Extension | AI Approach |
|---|---|---|---|---|---|---|
| Final examination | 50% | No | TBC | | No | |
| Practical assessment which involves hands-on tasks | 30% | No | Week 13 | | No | |
| Practical demonstration | 20% | No | Week 5 | | No | |

# Final examination

Assessment Type [1]: Examination Indicative Time on Task [2]: 38 hours
Due: **TBC** Weighting: **50%** Groupwork/Individual: Short extension [3]: No AI Approach:

The final exam will assess your overall understanding of the unit content, with a focus on applying key concepts covered throughout the semester.

On successful completion you will be able to:

- Compute coordinates' spatial descriptions and transformations
- Compute an industrial robot's kinematics and dynamics
- Describe an industrial robot's design process
- Write a program to complete a relevant task by the robot
- Use different control techniques for an industrial robot to automate a relevant task

# Practical assessment which involves hands-on tasks

Assessment Type [1]: Practice-based task Indicative Time on Task [2]: 20 hours Due: **Week 13** Weighting: **30%** Groupwork/Individual: Short extension [3]: No AI Approach:

Practical assessment

On successful completion you will be able to:

- Compute coordinates' spatial descriptions and transformations
- Compute an industrial robot's kinematics and dynamics
- Write a program to complete a relevant task by the robot

# Practical demonstration

Assessment Type [1]: Demonstration Indicative Time on Task [2]: 25 hours Due: **Week**

**5** Weighting: **20%** Groupwork/Individual: Short extension [3]: No AI Approach:

In-class demonstration for practical activity.

On successful completion you will be able to:

- Compute coordinates' spatial descriptions and transformations
- Compute an industrial robot's kinematics and dynamics
- Describe an industrial robot's design process
- Write a program to complete a relevant task by the robot

[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- Academic Success for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation.

[3] An automatic short extension is available for some assessments. Apply through the Service Connect Portal.

**Generative AI:**

In this unit, GenAI may be used as a learning support tool to assist with understanding concepts, debugging code, exploring engineering solutions, and developing professional skills. However, students are expected to demonstrate their own understanding of mechatronics, robotics, automation, and control systems. Reliance on GenAI-generated content without critical evaluation, verification, and proper attribution may constitute a breach of academic integrity requirements.

# Assessment Tasks

| Name | Weighting | Hurdle | Due | Groupwork/Individual | Short Extension | AI Approach |
|---|---|---|---|---|---|---|
| Final Exam | 50% | No | Examination time | Individual | No | Observed |
| Practical demonstration | 20% | No | Week 4 | Individual | No | Observed |
| Practical assessment | 30% | No | Week 13 | Group | No | Observed |

## Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 38 hours
Due: **Examination time**

Weighting: **50%**
Groupwork/Individual: Individual
Short extension [3]: No
AI Approach: Observed

You will undertake a final examination during the formal examination period.

On successful completion you will be able to:

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- Describe an industrial robot's design process
- Write a program to complete a relevant task by the robot
- Use different control techniques for an industrial robot to automate a relevant task

## Practical demonstration

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 25 hours
Due: **Week 4**
Weighting: **20%**
Groupwork/Individual: Individual
Short extension [3]: No
AI Approach: Observed

Demonstrating practical capability is an important component of professional practice in robotics and automation. In this task, you will demonstrate aspects of your practical engagement with unit concepts through an applied activity. This assessment supports the development of technical competence, professional practice, and confidence in applying theory in practice.

On successful completion you will be able to:

- Compute coordinates' spatial descriptions and transformations
- Compute an industrial robot's kinematics and dynamics
- Write a program to complete a relevant task by the robot
- Use different control techniques for an industrial robot to automate a relevant task

## Practical assessment

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 20 hours
Due: **Week 13**

Weighting: **30%**
Groupwork/Individual: Group
Short extension [3]: No
AI Approach: Observed

Applied problem-solving is central to mechatronics engineering practice. In this assessment, you will engage in practical tasks that require you to apply concepts and methods developed in the unit. This assessment develops practical reasoning, technical application skills, and the ability to work with engineering systems.

On successful completion you will be able to:

- Compute coordinates' spatial descriptions and transformations
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- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
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[3] An automatic short extension is available for some assessments. Apply through the Service Connect Portal.

# Delivery and Resources

1) Both lectures and practical classes commence in Week 1.

2) Unit announcements and important updates will be communicated through **iLearn** and your **Macquarie University email account**. Students are expected to check both regularly throughout the semester.

If you have any questions regarding the unit, please contact the Unit Convenor at **mohsen.asadnia@mq.edu.au**. When sending emails, please include the unit code in the subject line to help ensure a timely response.

Please note that all official communication from the teaching team will be sent to your Macquarie

University email address.

3) Full details about the resources will be available on ilearn page.

# Unit Schedule

Full details about the resources will be available on ilearn page.

# Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

## Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit connect.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

## Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing an

d maths support, academic skills development and wellbeing consultations.

## Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

## Academic Success

Academic Success provides resources to develop your English language proficiency, academic writing, and communication skills.

- Ask a Study Coach
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

## Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

## Student Enquiries

Got a question? Ask us via the Service Connect Portal, or contact Service Connect.

## IT Help

For help with University computer systems and technology, visit https://students.mq.edu.au/support/technology/service-desk.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

# Changes from Previous Offering

This unit has been redesigned to align with Macquarie University's EPIC educational approach, which emphasises engaging, student-centred learning experiences that connect theory with authentic industry and real-world applications. The approach encourages students to actively participate in their learning, develop professional skills, and apply knowledge to practical engineering challenges.

As part of this redesign, a project-based learning (PBL) component has been integrated into the lecture program. Students will be provided with a comprehensive project document on iLearn at the beginning of the semester. Throughout the session, students will progressively work on different stages of this project during lecture time.

Each week's project activities are directly linked to the concepts and techniques introduced in the corresponding lecture. Approximately half of each lecture will be dedicated to the delivery of core theoretical content, while the remaining time will be used for guided project work, discussion, design activities, and problem-solving exercises.

The project has been designed to simulate a realistic mechatronics and automation engineering challenge. By progressively applying the knowledge gained each week, students will develop and refine a complete engineering solution that addresses a real-world automation scenario. This approach aims to strengthen students' technical understanding, systems-thinking abilities, teamwork, problem-solving skills, and readiness for industry practice.

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Unit information based on version 2026.04 of the Handbook