



# MTRN6026

## Mechatronic Systems

Session 2, In person-scheduled-weekday, North Ryde 2024

*School of Engineering*

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## General Information

### Unit convenor and teaching staff

#### Convenor

Leonardo Callegaro

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#### Contact via email

44 Waterloo Road, Level 1

Wed 2-4pm (upon email appointment)

#### Lecturer

Subhas Mukhopadhyay

[subhas.mukhopadhyay@mq.edu.au](mailto:subhas.mukhopadhyay@mq.edu.au)

#### Contact via email

44 Waterloo Road, Room 134

Mon 9-11am (upon email appointment)

#### Teaching staff (practicals)

Waqas Afridi

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### Credit points

10

### Prerequisites

### Corequisites

### Co-badged status

### Unit description

Robotics and automation have the potential to revolutionise the way we interact with the world. In many scenarios, robots can work longer or in tougher environments than humans can. However, they can also be confused by everyday scenarios that would pose no difficulty to a human child. So when, how, and why might it make sense to bring robotics and automation into the picture? And what does it look like to do so responsibly? What are the components of the robot? What is the process of designing and manufacturing robots? How can Artificial Intelligence be applied in robotics? These are some questions that we will cover in this unit. In the Robotic and Automation unit, you will also learn about the Design and Development of Robots, Sensing and Perception, Motion Planning, Spatial Description and Transformations, Manipulator Kinematics, Dynamics and more. The unit will include 13 weeks of practical sessions where you learn about automation and coding of various types of robots.

## 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:** Describe and differentiate the components of mechatronic systems

**ULO2:** Analyse the performance of AC motor drives and controller

**ULO3:** Apply pneumatics, and PLCs integrated with pneumatics, to control mechatronic systems

**ULO4:** Design and evaluate DC motors controller

**ULO5:** Design and analyse the performance of the power supply for a Mechatronics system

**ULO6:** Program and utilise industrial robots

## 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 hurdle requirements.

**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 submissions and Resubmissions

Online quizzes, in-class activities, or scheduled tests and exam must be undertaken at the time indicated in the unit guide. All other assessments must be submitted by 12:00 pm on their due date. Should either of these assessments be missed due to illness or misadventure, students should apply for Special Consideration.

Assessments not submitted by the due date will receive a mark in accordance with the late submission policy as follows: A 12-hour grace period will be given after which the following deductions will be applied to the awarded assessment mark: 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time, a mark of zero (0) will be given. For example, an assessment worth 20% is due 5 pm on 1 September. Student A submits the assessment at 1

pm, 3 September. The assessment received a mark of 15/20. A 20% deduction is then applied to the mark of 15, resulting in the loss of three (3) marks. Student A is then awarded a final mark of 12/20.

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](mailto:ask.mq.edu.au).

## Assessment Tasks

| Name   | Weighting | Hurdle | Due            |
|--|-----------|--------|----------------|
| <a href="#">Weekly group activity assessment</a>       | 20%       | No     | Weekly         |
| <a href="#">Practical Laboratory</a>                   | 20%       | Yes    | Week 5, Week 9 |
| <a href="#">Demonstration of the PLC based project</a> | 20%       | No     | Week 13        |
| <a href="#">Final Exam</a>                             | 40%       | Yes    | Exam Period    |

### Weekly group activity assessment

Assessment Type <sup>1</sup>: Practice-based task

Indicative Time on Task <sup>2</sup>: 14 hours

Due: **Weekly**

Weighting: **20%**

Students are required to submit an assessment in class every week. This will be a group activity but the students will submit a report (about 200 words) individually.

On successful completion you will be able to:

- Describe and differentiate the components of mechatronic systems
- Analyse the performance of AC motor drives and controller
- Apply pneumatics, and PLCs integrated with pneumatics, to control mechatronic systems
- Design and evaluate DC motors controller
- Design and analyse the performance of the power supply for a Mechatronics system

## Practical Laboratory

Assessment Type <sup>1</sup>: Lab report

Indicative Time on Task <sup>2</sup>: 8 hours

Due: **Week 5, Week 9**

Weighting: **20%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

The students will conduct practical laboratory and write a report on the first activity.

On successful completion you will be able to:

- Describe and differentiate the components of mechatronic systems

## Demonstration of the PLC based project

Assessment Type <sup>1</sup>: Demonstration

Indicative Time on Task <sup>2</sup>: 8 hours

Due: **Week 13**

Weighting: **20%**

The students will work in small groups on a PLC-based project activities.

On successful completion you will be able to:

- Describe and differentiate the components of mechatronic systems
- Analyse the performance of AC motor drives and controller
- Apply pneumatics, and PLCs integrated with pneumatics, to control mechatronic systems
- Design and evaluate DC motors controller
- Design and analyse the performance of the power supply for a Mechatronics system

## Final Exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 20 hours

Due: **Exam Period**

Weighting: **40%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Final Exam covering all unit content

On successful completion you will be able to:

- Describe and differentiate the components of mechatronic systems
- Analyse the performance of AC motor drives and controller
- Apply pneumatics, and PLCs integrated with pneumatics, to control mechatronic systems
- Design and evaluate DC motors controller

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<sup>1</sup> 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
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

This information is made available in [ilearn.mq.edu.au](https://ilearn.mq.edu.au)

## Unit Schedule

This information is made available in [ilearn.mq.edu.au](https://ilearn.mq.edu.au)

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](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 \(https://students.mq.edu.au/su\)](https://students.mq.edu.au/su)

[pport/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 [ask.mq.edu.au](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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 and 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/>

## The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [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 [AskMQ](#), or contact [Service Connect](#).

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

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.

## Engineers Australia (EA) Competency Standards Mapping

| EA Competency Standard   |  | Unit Learning Outcomes             |
|--------------------------|--|------------------------------------|
| Knowledge and Skill Base | 1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline. | ULO1, ULO2                         |
|                          | 1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.                                     |                                    |
|                          | 1.3 In-depth understanding of specialist bodies of knowledge   | ULO1, ULO2, ULO3, ULO4, ULO5, ULO6 |
|                          | 1.4 Discernment of knowledge development and research directions   | ULO2                               |
|                          | 1.5 Knowledge of engineering design practice   | ULO4                               |
|                          | 1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.                     |                                    |



|                                      |   |                              |
|--------------------------------------|---|------------------------------|
| Engineering Application Ability      | 2.1 Application of established engineering methods to complex problem solving                   | ULO2, ULO3                   |
|                                      | 2.2 Fluent application of engineering techniques, tools and resources.                          | ULO2, ULO3, ULO4, ULO5, ULO6 |
|                                      | 2.3 Application of systematic engineering synthesis and design processes.                       |                              |
|                                      | 2.4 Application of systematic approaches to the conduct and management of engineering projects. |                              |
| Professional and Personal Attributes | 3.1 Ethical conduct and professional accountability.  | ULO4                         |
|                                      | 3.2 Effective oral and written communication in professional and lay domains.                   | ULO1, ULO2                   |
|                                      | 3.3 Creative, innovative and pro-active demeanour.  |                              |
|                                      | 3.4 Professional use and management of information.   |                              |
|                                      | 3.5 Orderly management of self, and professional conduct.                                       | ULO4                         |
|                                      | 3.6 Effective team membership and team leadership   |                              |

Unit information based on version 2024.03 of the [Handbook](#)