MTRN4066

Advanced Mechatronic Engineering

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Engineering

Contents

General Information

Unit convenor and teaching staff
Unit Convenor and Lecturer
David Inglis
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Contact via email
3MD-160
Tuesdays 9-10am @3MD-160

Credit points
10

Prerequisites
MTRN3026 and ELEC3024

Corequisites

Co-badged status

Unit description
This unit integrates prior learning in a specialist area of engineering with problem solving, emerging technology and aspects of engineering application, technical reporting and self-management to prepare students to work at a professional capacity. The unit aims to address the application of fundamental principles and methods at an advanced level in the context of standards and practices, modelling, analysis, design and practical implementation. The unit also develops skills in the critical evaluation of information, software and sources of error, and experimental methods. Learning will be achieved using case studies, laboratories, presentations, group work and/or traditional lecture format. The specific topics will focus on current advances in the area such as microcontrollers, motors and drive systems, control systems, sensors and actuators and electro-mechanical interfacing.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Industry, Innovation and Infrastructure

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: Design, numerically-model, implement, and test a digital motion control system for a non-linear problem

ULO2: Demonstrate, problem solving, initiative, time management, and record keeping, skills in the completion of a significant project

ULO3: Research and evaluate, through advanced knowledge, the modelling and use of modern drive technology

ULO4: Proficiently articulate and critique advanced mechatronic principles, including convolutional neural networks, machine vision, and 3D printing

General Assessment Information

To pass this unit you need to: Achieve a total mark equal to or greater than 50% across all aggregate of assessments, and acheive a grade of at least 50% on the final exam (Hurdle). The final exam is a hurdle because it is the only invigilated assessment of mulitple learning outcomes. If you make a reasonable attempt at the hurdle, but miss it, you will be given a second opportunity. This will be during the supplementary examination period and you will be notified of the exact day and time after the publication of final results for the unit. The second attempt at a hurdle assessment is graded as pass/fail. The maximum grade for a second attempt is the hurdle threshold grade of 50%.

We strongly encourage all students to actively **participate in all learning activities**. Regular engagement is crucial for your success in this unit, as these activities provide opportunities to deepen your understanding of the material, collaborate with peers, and receive valuable feedback from instructors, to assist in completing the unit assessments. Your active participation not only enhances your own learning experience but also contributes to a vibrant and dynamic learning environment for everyone.

Late Assessment Submission Penalty A 5% penalty (of the total possible mark of the task) will be applied for each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th 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 a technical concern.

Assessment Tasks

Name	Weighting	Hurdle	Due
Homework/problem sets	0%	Yes	4 times througout session
Report 1	10%	No	Week 3
Report 2	11%	No	Week 6
Report 3	11%	No	Week 9

Name	Weighting	Hurdle	Due
Log Book	11%	No	Week 12
Project Demonstration	11%	No	Week 12
Report - Final	11%	No	Week 12
Final Exam	35%	Yes	Exam Period

Homework/problem sets

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 10 hours
Due: **4 times througout session**
Weighting: **0%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Development of knowledge and skills requires repeated practice. Four problem sets will be assigned based on lecture content. Each assessment is graded as pass/fail. To pass this hurdle assessment, you must demonstrate that practice by making a reasonable attempt to answer each question.

On successful completion you will be able to:

- Demonstrate, problem solving, initiative, time management, and record keeping, skills in the completion of a significant project
- Research and evaluate, through advanced knowledge, the modelling and use of modern drive technology
- Proficiently articulate and critique advanced mechatronic principles, including convolutional neural networks, machine vision, and 3D printing

Report 1

Assessment Type [1]: Report
Indicative Time on Task [2]: 10 hours
Due: **Week 3**
Weighting: **10%**

Stage 1 of project report. Include relevant system parameters need to model system and a circuit diagram for the electrical system.

On successful completion you will be able to:

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Report 2

Assessment Type [1]: Project
Indicative Time on Task [2]: 10 hours
Due: **Week 6**
Weighting: **11%**

Stage 2 of project report should build on the stage 1. You should respond to all feedback and now include a full derivation of the mathematical model of the closed loop system and conclude with well presented equation of motion as a differential equation.

On successful completion you will be able to:

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Report 3

Assessment Type [1]: Report
Indicative Time on Task [2]: 10 hours
Due: **Week 9**
Weighting: **11%**

Stage 3 of the Report should build on stage 2 and respond to feedback. It should now include performance predictions based on numerical solutions to the equations of motion. It is expected that you will update your control approach to achieve good performance.

On successful completion you will be able to:

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linear problem
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Log Book

Assessment Type [1]: Lab book
Indicative Time on Task [2]: 4 hours
Due: **Week 12**
Weighting: **11%**

Assessment of record keeping in Log book

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Project Demonstration

Assessment Type [1]: Demonstration
Indicative Time on Task [2]: 10 hours
Due: **Week 12**
Weighting: **11%**

Demonstrate your system performance at the same time that you submit your report. Grade criteria posted to iLearn

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Report - Final

Assessment Type [1]: Report
Indicative Time on Task [2]: 10 hours
Due: **Week 12**
Weighting: **11%**

Build on your previous report by responding to feedback. The report should now present a complete picture of the system included model prediction compared against measured results.

On successful completion you will be able to:

- Design, numerically-model, implement, and test a digital motion control system for a non-linear problem
- Demonstrate, problem solving, initiative, time management, and record keeping, skills in the completion of a significant project

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 11 hours
Due: **Exam Period**
Weighting: **35%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Invigilated Final Exam

On successful completion you will be able to:

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[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
- the Writing Centre 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

Delivery and Resources

Workshop and Practical Classes commence in week 1, inlcuding 9am Feb 24 (week 1). Practical Classes will be staffed by Wil Losereewanich.

Methods of Communication: We will communicate with you via your university email and through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to the unit convenor via the contact email on iLearn.

Unit Schedule

See iLearn for details

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 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/

Academic Success

Academic Success 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 the Service Connect Portal, 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/.

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

The offering in 2024 was run by a temporary convenor who was filling in for David Inglis. In that offering, some content was ommitted. With David back, the unit will be most similar to the 2023 offering. The 2023 student feedback was very positive with 89.5% of respondents feeling that the assessment tasks assisted learning, 89.4% found the learning activities engaging, and 84.2% recommending the unit to other students.

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

Unit information based on version 2025.04 of the Handbook