MTRN2060

Introduction to Mechatronics

Session 2, In person-scheduled-weekday, North Ryde 2022

School of Engineering

Contents

General Information

Unit convenor and teaching staff
Unit Convenor and Lecturer
David Inglis
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Tuesdays 4-5pm, Thursdays 8-9am (no appointment needed)

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Credit points
10

Prerequisites
((PHYS1010 and PHYS1020) or (PHYS1520 and MECH1001)) AND (MATH1020 or MATH1025) AND COMP1000

Corequisites

Co-badged status

Unit description
This unit introduces the basic components of mechatronic systems including sensors, actuators, decision-making components and the electronics that connect them. It details how these individual components work, and how they are integrated into simple systems. This process empowers students to be engineers and makers who see how instrumentation and automation surround us and enable modern life. The unit builds on foundations in electricity, mechanics, and programming and asks participants to learn how sensors and actuators work (physics), how they interact (signals), and how they behave (system response). The unit is essential for further study in the field of mechatronic engineering, where the simple systems examined and experimented with here are built into complex automated electromechanical machines.

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: Demonstrate theoretical and practical understanding of a modern micro-controller

ULO2: Demonstrate theoretical and practical use of a variety of sensors, actuators, and appropriate interfacing electronics.

ULO3: Demonstrate practical use and theoretical understanding of electromechanics and small DC motors.

ULO4: Apply creativity and initiative in building self-directed mechatronic systems.

ULO5: Demonstrate a qualitative understanding of system response, including 2nd order systems.

General Assessment Information

This is no ordinary unit. There are no lectures, and there will be no final exam, and you can decide when you are ready to be assessed. This freedom will work well for some, but for others it may take some practice. But don't worry, we are here to help. If you feel like you are getting behind, please make use of my drop in office hours, where I can provide some extra tutoring.

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). For further details about grading, please refer below in the policies and procedures section.

Due Dates: Some due dates are needed to keep people moving along. By week 4 **(15-Aug)** all students must have completed the review and Arduino modules, and the Introductory Practical project. By week 7 (**5-Sept**) all students must have completed the Semiconductor, Electromechanics, and System Response 1 modules, and the Boppit Prac.

There will be NO PRACTICAL CLASSES in week 1. On campus activities commence in week 1. if you are unable to return to campus for the start of session, contact the unit convenor immediately.

Late Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following university standard late penalty applied. Please see https://students.mq.edu.au/study/assessment-exams/assessments for more information.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied 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. Submission time for all written assessments is set at **11:55 pm**. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

Assessments where Late Submissions will be accepted

In this unit, late submissions of the Sensor Data Analysis task will be accepted as per the above

policy.

Resubmission of works is not allowed

Assessment Tasks

Name	Weighting	Hurdle	Due
Self Directed Practical Project	10%	No	Week 13
Online Quizes	40%	No	Week 13
Weekly Practical Tasks	48%	No	Week 13
Sensor Data Analysis	2%	No	Week 7

Self Directed Practical Project

Assessment Type [1]: Project
Indicative Time on Task [2]: 11 hours
Due: **Week 13**
Weighting: **10%**

In the final two weeks of term you will complete and present a mechatronic project of your own design. The rubric for this task will be posted on iLearn.

On successful completion you will be able to:

- Demonstrate theoretical and practical understanding of a modern micro-controller
- Demonstrate theoretical and practical use of a variety of sensors, actuators, and appropriate interfacing electronics.
- Apply creativity and initiative in building self-directed mechatronic systems.

Online Quizes

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 20 hours
Due: **Week 13**
Weighting: **40%**

Each learning module contains an invigilated quiz. Students must demonstrate mastery of the module through practice quizzes before they are allowed to take the invigilated quiz. Invigilated quizzes can only be taken during SGTA.

On successful completion you will be able to:

- Demonstrate theoretical and practical understanding of a modern micro-controller
- Demonstrate theoretical and practical use of a variety of sensors, actuators, and appropriate interfacing electronics.
- Demonstrate practical use and theoretical understanding of electromechanics and small DC motors.
- Demonstrate a qualitative understanding of system response, including 2nd order systems.

Weekly Practical Tasks

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 13 hours
Due: **Week 13**
Weighting: **48%**

You will complete small projects in practical sessions with guidance provided by worksheets.

On successful completion you will be able to:

- Demonstrate theoretical and practical understanding of a modern micro-controller
- Demonstrate theoretical and practical use of a variety of sensors, actuators, and appropriate interfacing electronics.
- Demonstrate practical use and theoretical understanding of electromechanics and small DC motors.
- Demonstrate a qualitative understanding of system response, including 2nd order systems.

Sensor Data Analysis

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 4 hours
Due: **Week 7**
Weighting: **2%**

students will be given raw data from an accelerometer and asked to analyze the data.

On successful completion you will be able to:

- Demonstrate theoretical and practical use of a variety of sensors, actuators, and appropriate interfacing electronics.
- Demonstrate a qualitative understanding of system response, including 2nd order systems.

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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

Textbook: Introduction to Mechatronics and Measurement Systems by Alciatore and Histand. (3rd or 4th Edition is suitable)

Equipment: You must have your own Arduino electronics kit (as supplied to you in ENGG1000). It must contain the following items: 1 arduino, 1 breadboard, 30 wires, 10 LEDs various color, 10 330R, 2 10kR, 1 turnpot, 2 pushbottons, 1 buzzer. We will supply some extra components at no charge.

Textbook homepage: http://mechatronics.colostate.edu/

Technology and Software: We will use Arduino microcontrollers for all practical sessions. You will also be expected to analyse data using matlab, MS Excel or some other program of your choice.

Unit Schedule

There will be NO PRACTICAL CLASSES in week 1

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 ask.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/

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 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/.

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

We have a new practical module on Brushless motors.

Engineers Australia Competency 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.	1, 2, 3, 5
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	5
	1.3 In-depth understanding of specialist bodies of knowledge	1, 2, 3, 5
	1.4 Discernment of knowledge development and research directions	
	1.5 Knowledge of engineering design practice	

	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	
	2.2 Fluent application of engineering techniques, tools and resources.	
	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.	
	3.2 Effective oral and written communication in professional and lay domains.	
	3.3 Creative, innovative and pro-active demeanour.	4
	3.4 Professional use and management of information.	
	3.5 Orderly management of self, and professional conduct.	4
	3.6 Effective team membership and team leadership	