MTRN2060

Introduction to Mechatronics

Session 2, Weekday attendance, North Ryde 2021

School of Engineering

Contents

Session 2 Learning and Teaching Update

The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of units with mandatory on-campus classes/teaching activities.

Visit the MQ COVID-19 information page for more detail.

General Information

Unit convenor and teaching staff
Lecturer
David Inglis
david.inglis@mq.edu.au
Contact via david.inglis@mq.edu.au
9WW-321
Tuesdays 4-5pm, Thursdays 8-9am

Credit points
10

Prerequisites
((PHYS1510 or PHYS140) or ((PHYS1020 or PHYS106) and (PHYS1010 or PHYS107))) and (MATH1020 or MATH1025 or MATH136 or MATH133)

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 year, we are trying something new**.** 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 not. 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.

Late submissions and Re-submissions: Late submissions will not generally be considered. Extenuating circumstances will be considered upon lodgement of an application for special consideration. Re-submissions of work are not allowed.

Due Dates: By census date **(19-Aug)** all students must have completed 3 ilearn tests and the introductory practical project. Grades of 0 will be entered for these tasks if they have not been completed by that date. By **10 Oct**, all students must have completed 7 iLearn tests and 3 practical projects.

There will be NO PRACTICAL CLASSES in week 1

Assessment Tasks

Name	Weighting	Hurdle	Due
Weekly Practical Tasks	48%	No	8-11-2021
Sensor Data Analysis	2%	No	7-11-2021
Online Quizes	40%	No	3-11-2021
Self Directed Practical Project	10%	No	8-11-2021

Weekly Practical Tasks

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 13 hours
Due: **8-11-2021**
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: **7-11-2021**
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.

Online Quizes

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 20 hours
Due: **3-11-2021**
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.

Self Directed Practical Project

Assessment Type [1]: Project
Indicative Time on Task [2]: 11 hours
Due: **8-11-2021**
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.

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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.

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.

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
- Grade Appeal Policy
- Complaint Management 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

Student Support

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

dents.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- 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

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

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 School of Engineering is interested in improving its learning and teaching practices. This has led to growing use of project-based learning. We have observed that students completing well-designed and well-supported projects are highly engaged. We hypothesize that one of the factors that contributes to this engagement is student agency. The level of agency that students experience will depend on the scaffolds available to them within a supportive learning environment

For a unit in second year, it is not always practical to allow students to choose the content of their learning. An engineering program relies on structured, prerequisite knowledge and so earlier units must deliver prescribed technical knowledge and skill. While students cannot always choose what they learn, we can use systems that allow a flexible pace of study to foster mastery

learning, in which students persist until they reach a high level of understanding and performance. Choosing when to sit for assessment involves self-assessment and evaluative judgement of their own progress by students. This skill in self-assessment of progress has been linked with better learning.

Dr Inglis has taught the unit Introduction to Mechatronics (MTRN2060) for 8 years. For the past 5 years, the structure has been essentially the same: weekly lectures, weekly quizzes, weekly practicals, and final exam. Each student works on the same topics to the same deadlines. At the School of Engineering retreat in 2020, Inglis and colleagues developed an alternative structure that is inspired by their experiences with self-directed learning and the scholarship of teaching.

The new structure will be based on 11 modules and 7 practical activities. The modules comprise learning material, a practice quiz and an invigilated iLearn quiz, which we call a test. Students can choose to take the test at any time after they demonstrate mastery on the practice quiz. Similarly, practical activities can be started after mastery of prerequisite modules, and can be assessed at any time. To ensure progression, students must complete a certain number of modules and activities at census date and week 9. We hypothesize that this new learning and teaching method, and the increased agency in allowing students to work at their own pace and judge when they are ready for assessment, will mean longer-term retention of the unit material.