ELEC260

Introduction to Mechatronics

S2 Day 2018

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
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E6B-127
Mondays 4-5pm, Thursday 9-10am

Credit points
3

Prerequisites
COMP115 and (ENGG150 or ENGG170 or ELEC170) and (PHYS140 or PHYS106) and (MATH132 or MATH136))

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:

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.

Apply creativity and initiative in building small open ended mechatronic systems.

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

General Assessment Information

Grading and passing requirement for unit

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

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).

Late submissions and Resubmissions

Late submissions for assignments will attract a penalty of 10/100 marks per day. Extenuating circumstances will be considered upon lodgement of an application for special consideration. Re-submissions of work are not allowed.

There will be no practicals in week 1.

Assessment Tasks

Name	Weighting	Hurdle	Due
Final Exam (2 hour)	35%	No	Exam period
Practical Project	7%	No	13
Online Quizes	15%	No	Weeks 2-13
Labs/Practicals	40%	No	Weeks 2-12
Homework Problem Set	3%	No	Week 6

Final Exam (2 hour)

Due: **Exam period**
Weighting: **35%**

You will be permitted to bring one, double sided sheet of hand written notes and a calculator. No other formulas will be given during the exam.

On successful completion you will be able to:

- 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.

Practical Project

Due: **13**
Weighting: **7%**

In week 13 you will present an arduino project of your own design. The rubric for this task will be posted in advance.

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.
- Apply creativity and initiative in building small open ended mechatronic systems.

Online Quizes

Due: **Weeks 2-13**
Weighting: **15%**

From weeks 2 to 4 and 6 to 13 there will be online quizzes. The quizzes can be taken outside of class and can be attempted multiple times.

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.

Labs/Practicals

Due: **Weeks 2-12**

Weighting: **40%**

You will complete small projects in practical sessions. Most projects will be undertaken individually. Note that there will be no Practicals in week 1.

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.
- Apply creativity and initiative in building small open ended mechatronic systems.

Homework Problem Set

Due: **Week 6**
Weighting: **3%**

A conventional assignment which will include processing of sensor data. It must be submitted through a Turnitin link on iLearn and must contain some machine readable text.

On successful completion you will be able to:

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

Delivery and Resources

Textbook

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

Equipment

It is strongly recommended that you purchase an Arduino electronics kit. A typical kit costs $40-$100.

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

A unit schedule will be available on iLearn.

Learning and Teaching Activities

Lectures

Lectures are more than just reading from power point slides. They interactive and communal. Lecture recordings will not be available until near the end of session. They will be made available as a study resource for the final exam.

Practicals

Practicals are fun!

Optional Drop in Workshop

The drop in workshop is a chance to have completely free-form and open-ended discussions on mechatronic content. No new, asses-able content will be introduced.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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 *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

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

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

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

Results

Results shown in *iLearn*, 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.

Student Support

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

Learning Skills

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

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Demonstrate theoretical and practical understanding of a modern micro-controller
- Apply creativity and initiative in building small open ended mechatronic systems.

Assessment tasks

- Practical Project
- Labs/Practicals

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcome

- Apply creativity and initiative in building small open ended mechatronic systems.

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Assessment tasks

- Online Quizes
- Labs/Practicals
- Homework Problem Set

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- 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.

Assessment tasks

- Final Exam (2 hour)
- Practical Project
- Online Quizes
- Labs/Practicals
- Homework Problem Set

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Assessment tasks

- Final Exam (2 hour)
- Labs/Practicals
- Homework Problem Set

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcome

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

Assessment tasks

- Practical Project
- Labs/Practicals
- Homework Problem Set

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Assessment task

- Homework Problem Set

Changes from Previous Offering

Most practicals will be conducted individually.

The prac exam has been replaced with an open-ended prac project.

Changes in Response to Student Feedback

The duration and weighting of the final exam has been reduced from 3 hours to 2 and from 45% to 35%.

Week 1 will contain an introduction to programming the Arduino.