MECH468

Wireless Mechatronics

S2 Day 2018

Dept of Engineering

Contents

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General Information

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Credit points
3

Prerequisites
ELEC260 and ELEC324 and ELEC326

Corequisites

Co-badged status

Unit description
With the advancement of Internet of Things (IoT), microelectromechanical systems (MEMS),
smart sensors and actuators, wireless mechatronic devices, services, and systems are
experiencing fast growth in a variety of application fields, such as manufacturing,
transportation, and healthcare. This unit deals on the theory and practice of designing wireless
mechatronic systems using smart actuators, sensors, Interfacing, embedded controller,
wireless protocols with adaptive intelligence.

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 ability to implement wireless mechatronics systems including smart

sensors, actuators and wireless communicating devices in the context of wireless mechatronics

Ability to design and implement systems for remote monitoring and control

Design and implement software for wireless mechatronics systems

A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

General Assessment Information

To pass the unit, the student must complete the project activity with at least 50% marks. An overall mark of 50% and above is required to obtain a pass grade of P/CR/D/HD.

Assessment Tasks

Name	Weighting	Hurdle	Due
Project activity	30%	Yes	Week 4, 9, 13
Report Writing	5%	Yes	Week#2
Test #1	10%	No	Week 4
Test #2	15%	No	Week 8
Test #3	40%	Yes	Week 14

Project activity

Due: **Week 4, 9, 13**
Weighting: **30%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

The student will be involved in a project work either individually or in a group (to be decided later). The project work is related to wireless mechatronics. The project will involve selection of sensors and actuators, design of interfacing electronics and development of some mechatronic system using LoRaWAN network. More information will be provided during the course. It is expected the students will be able to come up with a prototype system. The students are expected to attend laboratory almost every week. The progress of the project will be assessed and the students need to achieve some milestones by Week $4, 8 and 13. The details will be described during the project works.

On successful completion you will be able to:

- Demonstrate ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless

mechatronics
- Ability to design and implement systems for remote monitoring and control
- Design and implement software for wireless mechatronics systems
- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Report Writing

Due: **Week#2**

Weighting: **5%**

This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

On Week#1, there will be presentation on research paper. The students will need to go through one research paper (will be discussed in detail in the class) and write a report (2-pages) on it. The report to be submitted at the end of Week#2.

On successful completion you will be able to:
- Demonstrate ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless mechatronics
- Ability to design and implement systems for remote monitoring and control

Test #1

Due: **Week 4**

Weighting: **10%**

The First test (Test #1) will take place on Week #4 and the content of the Week 1 to 3 will be assessed. The breifing will be provided during lectures.

On successful completion you will be able to:
- Demonstrate ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless mechatronics
- Ability to design and implement systems for remote monitoring and control

Test #2

Due: **Week 8**

Weighting: **15%**

The Second test (Test #2) will take place on Week #8 and the content of the Week 5 to 8 will be assessed. This will be a 45 minutes test. The breifing will be provided during lectures.

On successful completion you will be able to:

- Ability to design and implement systems for remote monitoring and control

- Design and implement software for wireless mechatronics systems

- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Test #3

Due: **Week 14**

Weighting: **40%**

This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

The Final test (Test #3) will take place on Week #14 (exact date to be decided later) and the content of the Week 1 to 13 will be assessed. This will be a 120 minutes test. The breifing will be provided during lectures. The student must sit for this test and obtain a minimum of 40% marks to pass the unit.

On successful completion you will be able to:

- Demonstrate ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless mechatronics

- Ability to design and implement systems for remote monitoring and control

- Design and implement software for wireless mechatronics systems

- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Delivery and Resources

Lecture materials will be uploaded with iLearn during the lecture time

Unit Schedule

Weekly schedule (Tentative):

Week#1: Unit description; Assessment; Big picture, Wireless Mechatronics; challenges and opportunities; Project description

Week#2: Smart Sensors:

Week#3: Smart Actuators emphasizing on the drivers of different motors - Review

Week#4: Communication Fundamentals (Ethernet; RS232, USB); Test#1

Week#5: Wireless Fundamentals; Antenna.

Week#6: Wireless Protocols; Internet of Things

Week#7: Distributed Estimation in Wireless Systems; Directed/Undirected Communication Protocols.

Week#8: Consensus/Average Consensue Algorithms; Target Tracking. Test#2

Week#9: Fault Diagnosis in Wireless System

Week#10: Security Design in Wireless Mechatronics;

Week#11: Software Design for Wireless Mechatronics;

Week#12: Application Examples (Smart Home, Solar panel, Power management, green house etc.)

Week#13: Review and Discussion; Test #3

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 ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless mechatronics
- Ability to design and implement systems for remote monitoring and control
- Design and implement software for wireless mechatronics systems
- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Assessment tasks

- Project activity
- Test #1
- Test #2
- Test #3

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:

Assessment tasks

- Project activity

- Report Writing
- Test #1

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:

Learning outcomes

- Ability to design and implement systems for remote monitoring and control
- Design and implement software for wireless mechatronics systems

Assessment tasks

- Project activity
- Test #3

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 ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless mechatronics
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- Design and implement software for wireless mechatronics systems
- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Assessment tasks

- Project activity

- Report Writing
- Test #1
- Test #2
- Test #3

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:

Learning outcomes

- Demonstrate ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless mechatronics
- Ability to design and implement systems for remote monitoring and control
- Design and implement software for wireless mechatronics systems

Assessment tasks

- Project activity
- Report Writing
- Test #1
- Test #2
- Test #3

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 outcomes

- Demonstrate ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless mechatronics

- Ability to design and implement systems for remote monitoring and control
- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Assessment tasks

- Project activity
- Test #1
- Test #2

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:

Learning outcomes

- Design and implement software for wireless mechatronics systems
- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Assessment tasks

- Project activity
- Report Writing
- Test #1
- Test #3

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Demonstrate ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless

mechatronics

- Ability to design and implement systems for remote monitoring and control
- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Assessment tasks

- Project activity
- Test #2

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Demonstrate ability to implement wireless mechatronics systems including smart sensors, actuators and wireless communicating devices in the context of wireless mechatronics
- Ability to design and implement systems for remote monitoring and control
- Design and implement software for wireless mechatronics systems
- A good understanding of Data storage, security and cloud computing in the context of wireless mechatronics

Assessment tasks

- Project activity
- Test #2
- Test #3

Changes since First Published

Date	Description
08/08/2018	The email address of Eshrat has been changed