



ENGG4201

Internet of Things Systems Design

Session 1, In person-scheduled-weekday, North Ryde 2023

School of Engineering

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General Information

Unit convenor and teaching staff

Lecturer

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Contact via email

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Friday 9:0am to 1:0pm

Credit points

10

Prerequisites

Completion of 200CP at 1000 level or above or Admission in MEngElecEng

Corequisites

Co-badged status

Unit description

This unit will broadly explore the underlying technologies, applications, and systems design principles underlying the Internet of Things. Students will explore the principles of IoT systems while engaging in their own group-based design and build of a practical IoT system. To support the design and build process, the principles covered will begin with foundation knowledge in IoT devices and systems, including network architectures and technologies, sensors, embedded processing and actuators. Concepts will then build towards notions of IoT communications and data protocols, security, data visualization, Machine Learning and Artificial Intelligence techniques for IoT data, all highlighted by IoT application case studies.

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: Apply knowledge of fundamental components to implement IoT system such as sensors, embedded processors, interfacing electronics and wireless communicating devices, in designing and building a simple IoT system.

ULO2: Select proper hardware to design and implement IoT systems for remote

monitoring and control

ULO3: Explain critical IoT communications technologies and network protocols, security and implementation

ULO4: Demonstrate understanding of data management, visualization and analysis techniques for IoT Data

ULO5: Investigate, critically evaluate, and communicate the effectiveness and performance of different IoT systems and their constituent components.

General Assessment Information

The details of the assessment, report and demonstration will be discussed during the lectures as well as during the practical activities. The guidelines along with due dates will be provided in iLearn.

The lectures as well as pracs activities will start from Week#1: The lecture only for the First week will be held on Zoom. The link will be provided.

Requirements to Pass this Unit

Grading and passing requirement for unit: In order to pass this unit a student must obtain a total mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD), and meet the following hurdle requirement (below).

Hurdle Requirement: The final examination is a hurdle because it is the only invigilated individual assessment in the unit. A grade of 50% or more in the final exam is a condition of passing this unit.

If you are given a second opportunity to sit the final examination as a result of failing to meet the minimum mark required, you will be offered that chance during the supplementary examination period and 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%.

Late Assessment Submission

Late assessments for the submission of reports are not accepted in this unit unless a [Special Consideration](#) has been submitted and approved.

The finer details of individual versus group reports will be discussed during the practical activities and provided in iLearn.

Assessment Tasks

Name	Weighting	Hurdle	Due
Final Examination	30%	Yes	Week 14
Demonstration of project work	20%	No	Week 5, 8 and 12

Name	Weighting	Hurdle	Due
Individual research report	20%	No	Week 3, 6, 9 and 13
Report on practical implementation of IoT project	30%	No	Week 4, 7, 10 and 13

Final Examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 12 hours

Due: **Week 14**

Weighting: **30%**

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

Final Examination

On successful completion you will be able to:

- Apply knowledge of fundamental components to implement IoT system such as sensors, embedded processors, interfacing electronics and wireless communicating devices, in designing and building a simple IoT system.
- Select proper hardware to design and implement IoT systems for remote monitoring and control
- Explain critical IoT communications technologies and network protocols, security and implementation
- Demonstrate understanding of data management, visualization and analysis techniques for IoT Data

Demonstration of project work

Assessment Type ¹: Demonstration

Indicative Time on Task ²: 9 hours

Due: **Week 5, 8 and 12**

Weighting: **20%**

Group-based demonstration of project work

On successful completion you will be able to:

- Apply knowledge of fundamental components to implement IoT system such as sensors, embedded processors, interfacing electronics and wireless communicating devices, in designing and building a simple IoT system.
- Select proper hardware to design and implement IoT systems for remote monitoring and control
- Explain critical IoT communications technologies and network protocols, security and implementation
- Demonstrate understanding of data management, visualization and analysis techniques for IoT Data

Individual research report

Assessment Type **1**: Report

Indicative Time on Task **2**: 9 hours

Due: **Week 3, 6, 9 and 13**

Weighting: **20%**

Individual research report on IoT literature and application case studies

On successful completion you will be able to:

- Investigate, critically evaluate, and communicate the effectiveness and performance of different IoT systems and their constituent components.

Report on practical implementation of IoT project

Assessment Type **1**: Project

Indicative Time on Task **2**: 14 hours

Due: **Week 4, 7, 10 and 13**

Weighting: **30%**

Working in groups, students will present the design problem and solution in the form of written report

On successful completion you will be able to:

- Apply knowledge of fundamental components to implement IoT system such as sensors, embedded processors, interfacing electronics and wireless communicating devices, in

designing and building a simple IoT system.

- Select proper hardware to design and implement IoT systems for remote monitoring and control
- Explain critical IoT communications technologies and network protocols, security and implementation
- Demonstrate understanding of data management, visualization and analysis techniques for IoT Data

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

The lecture materials, guidelines and other necessary information will be uploaded in iLearn.

The lecture and practical activities will start from Week#1. The lecture for the first week only will be on zoom.

Unit Schedule

The lecture as well as practical activities will start from Week#1.

The tentative plan for this year is as follows:

Lectures plan:

Week#1: Introduction of the unit, pracs, assessments, selection of components

Week#2: Description of a few projects

Week#3: Sensors and Interfacing

Week#4: Sensors and Interfacing (contd)

Week#5: Embedded Processors

Week#6: Wireless Communication

Week#7: Power for IoT nodes

Week#8: IoT Protocols

Week#9: Report Writing

Week#10: IoT Data Analytics

Week#11: IoT Security

Week#12: IoT Access Control

Week#13: Review of the unit

Pracs Plan:

Week#1: Hands-on of IoT system – big picture

Week#2: Introduction to Proteus software

Week#3: Project presentation

Week#4: LoRA based IoT system

Week#5: BT/WiFi based IoT system

Week#6: API design

Week#7: API design (contd.)

Week#8: Project execution

Week#9: Project execution

Week#10: Project execution

Week#11: Project execution

Week#12: Project execution

Week#13: Demonstration and Report submission

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.s.mq.edu.au\)](https://policies.s.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 \(https://students.mq.edu.au/su\)](https://students.mq.edu.au/su)

[pport/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 Advocacy](#) provides independent advice on MQ policies, procedures, and processes

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

2021 S1 was the first time the unit was offered and the unit was liked by all students.

In 2021, we have kept only last 3 weeks for the hands-on project activities. We have taught the fundamentals in the first 9 weeks. We lost one week due to Easter holiday.

We have made some changes in 2022 and allowed the students to work for 5 weeks on the project after the break. We expected the quality of the project will be much better but we had students who did not have necessary electronics background for IoT unit.

In 2023, we will ask the students to think of the project from the beginning and they will be also working on the taught practical part. We hope this will provide more clear picture about the total execution of the project.

Engineers Australia Competency Mapping

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
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	#2
	1.3 In-depth understanding of specialist bodies of knowledge	#1, #2, #3
	1.4 Discernment of knowledge development and research directions	#5
	1.5 Knowledge of engineering design practice	#4
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	#1, #4
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	#1, #2, #3
	2.2 Fluent application of engineering techniques, tools and resources.	#5
	2.3 Application of systematic engineering synthesis and design processes.	
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	#5
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	
	3.2 Effective oral and written communication in professional and lay domains.	#4
	3.3 Creative, innovative and pro-active demeanour.	
	3.4 Professional use and management of information.	
	3.5 Orderly management of self, and professional conduct.	
	3.6 Effective team membership and team leadership	#1, #3, #5