COMP8292

Sensor Networks, Cloud and Edge Computing in IoT

Session 2, In person-scheduled-weekday, North Ryde 2024

School of Computing

Contents

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General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites

Corequisites

Co-badged status

Unit description
This unit aims to provide a solid theoretical and practical understanding of wireless sensor networks (WSN), and cloud and edge technologies that augment the capabilities of such networks from an IoT context. This unit will provide a detailed understanding of WSN sensor communication architecture and technology, and will examine routing, power management, and security protocols that have been specifically designed for WSNs. The unit will further examine cloud, edge, and cellular technologies and investigate solutions that facilitate the convergence of cloud computing with IoT to create a mobile ecosystem that facilitates monitoring, data gathering, and enhanced connectivity.

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: Configure, administer, and troubleshoot wireless sensor communication protocols and complex IoT networks.

ULO2: Design and implement cloud-/edge-based IoT solutions and applications based on the customer requirements, and in accordance with the principles of project management to ensure an efficient and timely delivery of the said solutions and applications.

ULO3: Implement cloud computing-related tools and techniques such as virtual machines, and mobile services to augment sensor network capabilities.

ULO4: Identify security vulnerabilities, and design and implement security features' controls to protect wireless sensor networks and safeguard data stored in the cloud/ edge.

ULO5: Demonstrate an understanding of modern cellular network architecture and how it supports IoT and sensor networks.

ULO6: Demonstrate an understanding of power management in IoT devices and sensor networks.

General Assessment Information

Requirements to Pass this Unit

To pass this Unit, a Student must satisfactorily attempt All Assessments and achieve a Total Mark equal to or greater than 50%.

Late Assessment Submission Penalty

Unless a Special Consideration Request has been submitted and approved, a 5% Penalty (of the Total Possible Marks of an Assessment) would be applied for each day an Assessment has not been submitted, i.e., up until the 7th day (including the weekends). Subsequent to the 7th day, a Grade of '0' would be awarded even if the Assessment is submitted. The submission time for all uploaded Assessments is 11:55 PM. A 1 - hour grace period would be provided to Students who experience a technical concern. For reference, if an Assessment is worth 10 Marks of an entire Unit and a Student's Assessment is late by 19 hours (≈ 23 hours, 59 minutes, 59 seconds), 0.5 Marks (5% of the 10 Marks) would be deducted. If a Student's Assessment is late by 24 hours (≈ 47 hours, 59 minutes, 59 seconds), 1 Mark (10% of the 10 Marks) would be deducted, and so on.

For any late submission of the Time-sensitive Tasks, i.e., (scheduled) Workshop-based Tasks, Individual Presentation pertinent to Assignment 3 : Practice-based Task, and Final Exam, please apply for Special Consideration.

Assessments where late submissions would be accepted:

- Literature Review – Yes, Standard Late Penalty applies
- Assignment 3 : Practice-based Task (Group-based Report) – Yes, Standard Late Penalty

applies

Special Consideration

The Special Consideration Policy aims to support Students who have been impacted by short-term circumstances or events that are serious, unavoidable, and significantly disruptive, and which may affect their performance in an Assessment. If a Student experiences circumstances or events which affect their ability to complete the Assessments in this Unit on time, they should inform the Unit Convenor and subsequently submit a Special Consideration Request through Ask MQ.

Assessment Tasks

Name	Weighting	Hurdle	Due
Workshop-based Tasks	10%	No	Weekly
Literature Review	20%	No	Week 6's Sunday – 11:55 PM
Assignment 3	30%	No	Week 11's Sunday – 11:55 PM
Final Exam	40%	No	Session 2's Exam Period

Workshop-based Tasks

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 10 hours
Due: **Weekly**
Weighting: **10%**

Workshops offer Students an opportunity to learn and subsequently practice via Hands-on Activities in a Lab Setting under the supervision of a Lab Supervisor/Instructor. They further allow the Students to discuss the problems effectively with their Peers and maximize the Feedback they get on their work.

On successful completion you will be able to:
- Configure, administer, and troubleshoot wireless sensor communication protocols and complex IoT networks.
- Design and implement cloud-/edge-based IoT solutions and applications based on the customer requirements, and in accordance with the principles of project management to ensure an efficient and timely delivery of the said solutions and applications.

Literature Review

Assessment Type [1]: Literature review
Indicative Time on Task [2]: 25 hours
Due: **Week 6's Sunday – 11:55 PM**
Weighting: **20%**

Students will critically analyze relevant state-of-the-art Research Literature pertinent to the Discipline to present succinct arguments and conclusions in a highly systematic manner.

On successful completion you will be able to:

- Configure, administer, and troubleshoot wireless sensor communication protocols and complex IoT networks.
- Identify security vulnerabilities, and design and implement security features' controls to protect wireless sensor networks and safeguard data stored in the cloud/edge.
- Demonstrate an understanding of modern cellular network architecture and how it supports IoT and sensor networks.
- Demonstrate an understanding of power management in IoT devices and sensor networks.

Assignment 3

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 25 hours
Due: **Week 11's Sunday – 11:55 PM**
Weighting: **30%**

Students will Design, Implement, and subsequently Test a Real-world Cloud-based IoT Scenario using various tools.

On successful completion you will be able to:

- Configure, administer, and troubleshoot wireless sensor communication protocols and complex IoT networks.
- Design and implement cloud-/edge-based IoT solutions and applications based on the customer requirements, and in accordance with the principles of project management to ensure an efficient and timely delivery of the said solutions and applications.

- Implement cloud computing-related tools and techniques such as virtual machines, and mobile services to augment sensor network capabilities.
- Demonstrate an understanding of power management in IoT devices and sensor networks.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 40 hours
Due: **Session 2's Exam Period**
Weighting: **40%**

A Final Exam assessing the Students' overall mastery of the Unit's Content.

On successful completion you will be able to:
- Design and implement cloud-/edge-based IoT solutions and applications based on the customer requirements, and in accordance with the principles of project management to ensure an efficient and timely delivery of the said solutions and applications.
- Implement cloud computing-related tools and techniques such as virtual machines, and mobile services to augment sensor network capabilities.
- Identify security vulnerabilities, and design and implement security features' controls to protect wireless sensor networks and safeguard data stored in the cloud/edge.
- Demonstrate an understanding of modern cellular network architecture and how it supports IoT and sensor networks.
- Demonstrate an understanding of power management in IoT devices and sensor networks.

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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

Lectures

Live (In-person) Lecture Sessions will be held from Weeks 1 – 13, and would provide an opportunity for Students to ask Questions pertinent to the Weekly Topic(s) and to clarify anything that they might not be sure of. Owing to the Nature of this Unit, the Live (In-person) Lecture Sessions encourage Students to engage in a number of Brainstorming Activities and, therefore, participation in these Sessions is of the essence and critical to Students' success within this Unit. Also, Learnings embedded in these Sessions are indispensable for both Literature Review and Assignment 3 : Practice-based Task.

Workshops

Workshops (In-person) will be held from Weeks 2 – 13 and would offer Students an opportunity to learn, develop, and subsequently practice Concepts pertinent to the Unit's Content via Hands-on Tasks in a Lab Setting under the Supervision of the Lecturer. Workshops would also facilitate Students to discuss their respective Problems effectively with the Peers and maximize the Feedback they get on their Work.

Please note that Assignment 3 : Practice-based Task depends to a considerable extent, on the Learnings embedded in the Workshop Sessions. Therefore, participation in these Sessions is critical to Students' success within this Unit.

Assessments

Assessments will be made available on iLearn and would be submitted via Turnitin**.**

Recommended Readings

The Unit's Content has been drawn from a variety of sources, including but not limited to, Research Papers, White Papers, and Standards' Documents. Students are, therefore, highly encouraged to read the recommended respective Weekly Reading List in a bid to gain a solid understanding of the Weekly Topics.

Methods of Communication

The Unit Convenor / Lecturer will communicate with the Students via their respective Macquarie University's Email or through Announcements on iLearn. Queries may either be placed on the iLearn Discussion Board or could be sent to the Unit Convenor, Dr. Adnan Mahmood, at adna n.mahmood@mq.edu.au.

COVID Information

For latest information on the University's response to COVID-19, please refer to the Coronavirus Infection Page on the Macquarie University's website. Remember to check this Page regularly in case the information and requirements change during Semester 2, 2024. If there are any changes to this Unit in relation to COVID, these will be communicated via iLearn.

Unit Schedule

Week #	Topic
Week 1	The Internet of Things (IoT)
Week 2	Cloud, Fog, and Edge Computing – Part I
Week 3	Cloud, Fog, and Edge Computing – Part II
Week 4	IoT Security – A Case Study
Week 5	IoT Project Management
Week 6	Cellular IoT
Week 7	Introduction to Sensor Network – Motivation and Applications
Week 8	Introduction to Sensor Network – Architecture and Protocol Stack
Week 9	Routing Protocols in Sensor Networks
Week 10	Localization Techniques in Wireless Sensor Networks
Week 11	Guest Lecture
Week 12	Students' Presentations
Week 13	Revision

Note – This particular Unit is about you and your participation in the same is critical for your success within this Unit since the Learnings embedded in Lectures and Workshops are indispensable for both Literature Review and Assignment 3 : Practice-based Task. Please also note that Indvidual Presentations pertinent to Assignment 3 : Practice-based Task would be held during Week 12. In case of a Lecture or Workshop falling on a Public Holiday, alternate arrangements would be made and Students would be informed well in advance about the same.

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 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

No change to the delivery of the Unit is planned. Please note that the Teaching Staff highly values Student Feedback so as to continually improve the way this Unit is offered. Accordingly, please feel free to provide Constructive Feedback to the Teaching Staff.

Unit information based on version 2024.04 of the Handbook