

Course COMP6324: IoT Service Design and Engineering

Course Summary

IoT is an emerging technology that will transform business and societies across the world. Similar to AI, mobile or Cloud it will have a profound impact on the existing technology landscape, customer experience, operational processes and business models.

This course provides an overview of the topic from a business and technology perspective and allows the students to experience the full lifecycle of IoT, from the overall corporate strategy to the actual implementation of an IoT application.

This course is a project-based course and its design is based on the action-learning concept used at MIT and Harvard and the course design has been reviewed by professors at MIT and Harvard.

Assumed Knowledge

- Good knowledge of programming and basic knowledge of Web technologies
- Good knowledge of databases

These are assumed to have been acquired in the courses COMP1531 and COMP2041 or equivalent (good programming knowledge)

Course Aims

The course aims to provide the students with a holistic understanding of IoT from a business and technology perspective and help them understand what potential career options are.

Learning outcomes

After completing this course, students will be able to:

- Be familiar with IoT terminology
- Understand the impact of IoT on selected industries
- Create an IoT strategy
- Create an IoT architecture
- Create an IoT solution design
- Implement an IoT solution
- Understand the security risk of IoT
- Select potential career options

Teaching Approach

Lecture

The lectures provide the necessary theoretical knowledge or the project and assessments. The students are encouraged to discuss the lecture content with their assigned Industry and Student Mentors, as well as the lecturer.

Project

The students form teams of 3-5 in week 2 of the course. The Lecturer and Course Admin assign one Industry and one Student Mentor before the lecture in week 3 to each team. The assignment of the two mentors per team requires the student teams to submit their team name and members to the

Course Admin at the latest 48 hours before the lecture in week 3. The teams will meet their assigned Industry and Student Mentor during the class in week 3.

The role of the Industry Mentor is to discuss assignments with the students and provide their idea, expertise, experience and industry insights. The Industry Mentors are expected to spend around one hour per week with the student teams.

The role of the Student Mentor is to answer any question in relation to the assignment and to mark the assignments.

There will also be a Technology Mentor that supports the teams that chose to implement their IoT application on the provided Smart Campus Learning Platform. The Technology Mentor has access to the development team and the development team has direct contact to the vendor.

Besides the initial face to face meeting with the mentors in week 3, subsequent meetings need to be arranged by the student teams with their assigned mentors.

The MCIC has offered the student teams to conduct face to face session in their maker/event space. Please talk to the named MCIC contact to make sure there are no events during the time you would like to have the meetings.

The project has two main deliverables:

- A Word document, where IoT strategy, architecture and solution design are documented. A template will be provided on “piazza”.
- The code of an IoT solution that will be stored on GitHub. The student mentor will provide the relevant links.

The available Smart Campus Learning Platform is developed on top of Microsoft Azure IoT, leveraging some of the Microsoft reference solution, but adding additional capabilities, e.g. the possibility to create an IoT device simulator. The students can either develop an IoT application using the existing IoT Application Development Framework or extend the framework with their own functionality. Development can happen in C, C#, Java, Python and other programming language supported by the Microsoft .Net Framework. Although student teams can develop their IoT application on any platform, technical support is only available for the provided Smart Campus Learning Platform.

Industry Panel

The last class is an industry panel, with people from different kinds of organisations. The panel will discuss IoT careers and through the diversity of the panellist, students will see the breadth of career options in IoT. The industry panel is supported and moderated by the IoT Alliance Australia and IoE Community Sydney.

Course Schedule

Week	Date/Time	Location	Module	Form	Assignment
1	27.02.18 – 6pm	OMB-G32	IoT 101	Lecture	n/a
2	06.03.18 – 6pm	OMB-G32	Industry Impact of IoT	Lecture	n/a
3	13.03.18 – 6pm	OMB-G32	IoT Strategy	Lecture	IoT Quiz – Part 1 & 2
4	20.03.18 – 6pm	Organised by student teams		Project	IoT Solution Specification - Strategy
5	27.03.18 – 6pm	OMB-G32	IoT Architecture	Lecture	n/a
6	10.04.18 – 6pm	Organised by student teams		Project	IoT Solution Specification - Architecture
7	17.04.18 – 6pm	OMB-G32	IoT Solution Design and Implementation	Lecture	n/a
8	24.04.18 – 6pm	Organised by student teams		Project	IoT Solution Specification – Design
9	01.05.18 – 6pm			IoT Application Implementation	
10	08.05.18 – 6pm				
11	15.05.18 – 6pm	OMB-G32	IoT Security	Lecture	IoT Quiz – Part 3
12	22.05.18 – 6pm	MCIC	IoT Careers	Industry Panel	Reflection paper

Assessment

The course assessment consists for 4 deliverables that are described in detail below.

IoT Quiz (30%)

- Asks questions on the presented content in the lectures
- Has 3 parts: IoT 101, Industry Impact of IoT and IoT Security
- Part 1 & 2 have to be submitted on “piazza” until Friday, 16.03.18, EOD
- Part 3 has to be submitted on “piazza” until Friday, 18.05.18, EOD
- The IoT Quiz is an individual assignment.
- Templates for the 3 parts can be found on “piazza”
- Each part of the quiz has 10 questions and counts for 10% of the mark, so 30% in total

Marking criteria:

Answers to the questions are either right or wrong.

IoT Solution Specification (30%)

- Asks the student teams to create an IoT solution specification that is the basis for the IoT Application the students implement
- Has 3 parts: IoT Strategy, IoT Architecture and IoT Design
- IoT Strategy and Architecture has to be submitted on “piazza” until Friday, EOD in the week the lecture occurred. IoT Design has to be submitted on “piazza” together with the IoT Application Implementation deliverable
- The IoT Solution Specification is a deliverable create by the student teams.
- Templates for the 3 parts can be found on “piazza”
- Each part of the IoT Solution Specification counts for 10% of the mark, so 30% in total

Marking criteria - Strategy:

- Full: All section in the strategy template are filled. A use case is selected. The selection is logically conclusive. All parts of the strategy are consistent. No examples presented in the lecture are used.
- Partial: Based on the 5 criteria above. Each missing criteria means 20% off the “strategy mark”, so 2% (as the whole strategy part counts 10% towards the overall mark)

Marking criteria - Architecture:

- Full: All section in the architecture template are filled. The use case from the strategy part is chosen. (As an alternative the student teams can extend the IoT Application Framework on the platform in which case the solution architecture need to be based on the solution architecture of the IoT Application Framework that is presented in class) Each architecture diagram has an explanation of all its components. All parts of the architecture are consistent. No examples presented in the lecture are used.
- Partial: Based on the 5 criteria above. Each missing criteria means 20% off the “architecture mark”, so 2% (as the whole architecture part counts 10% towards the overall mark)

Marking criteria - Design:

- Full: All section in the design template are filled. The solution architecture from the architecture part is further detailed in the design. Each design diagram has an explanation of all its components. All parts of the design are consistent and linked back to solution architecture components. No examples presented in the lecture are used.
- Partial: Based on the 5 criteria above. Each missing criteria means 20% off the “design mark”, so 2% (as the whole design part counts 10% towards the overall mark)

IoT Application Implementation (30%)

- Asks the student teams to create the code for an IoT application that runs on the Smart Campus Learning Platform provided for the course. The Smart Campus Learning Platform is the result of the Smart Campus showcase project of the IoT Alliance Australia. It is based on

Microsoft Azure IoT and has been extended into an IoT Application Framework that also allows the simulation of IoT devices and included IoT edge functionality.

- The teams can choose between: Build an IoT application (on the existing platform) or extend the developed IoT Application Development Framework.
- The code for the solution has to be submitted on GitHub. The IoT Solution Specification - Design document needs to contain a link to the relevant GitHub folder. Each team will get their own GitHub folder and the URL will be provided by the Student Mentor.
- A Windows Professional version is required for development on Microsoft Azure IoT. If your team does not have at least on Windows Professional version, please talk to the Technology Mentor, who will work with the development team to find a solution.
- The demonstration of the running application to the student mentor has to happen until Friday, 18.05.18, EOD. By then the source code needs to be on GitHub.

Marking criteria:

- Full: All parts of the solution design are implemented. The running IoT application is demonstrated to the Student Mentor. The code is available in GitHub.
- Partial: Based on the 3 criteria above. Each missing criteria means 10% off the mark (as the whole application implementation counts 30% towards the overall mark)

Reflection Paper (10%)

- Allows the student to reflect on what she/he has learned during the course.
- Has to be submitted on “piazza” until Friday, 25.05.18, EOD
- The Reflection Paper is an individual assignment.
- A Template can be found on “piazza”
- Maximum 1 page with font size 10
- It counts for 10% of the mark

Marking criteria:

- Full: Answers to the following questions.
 - o Why is it important to look at IoT from a business and technology perspective?
 - o What could be the impact of IoT on my career?
 - o What could be the impact of IoT on society?
 - o How can IoT help with environmental issues?
 - o How can IoT help with personal health?
- Partial: Every unanswered question leads to a decrease of 20% in the “reflection paper mark”, so 2% of the overall course mark.

Mapping from outcomes to assessment

Assessment Learning Outcome	IoT Quiz	IoT Solution Specification	IoT Application Implementation	Reflection Paper
Be familiar with IoT terminology	X			X
Understand the impact of IoT on selected industries	X			X
Create an IoT strategy		X		
Create an IoT architecture		X		
Create an IoT solution design		X		
Implement an IoT solution			X	
Understand the security risk of IoT	X			X

Select potential career options				X
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Student Conduct Statement

The **Student Code of Conduct** ([Information](#), [Policy](#)) sets out what the University expects from students as members of the UNSW community. As well as the learning, teaching and research environment, the University aims to provide an environment that enables students to achieve their full potential and to provide an experience consistent with the University's values and guiding principles. A condition of enrolment is that students *inform themselves* of the University's rules and policies affecting them and conduct themselves accordingly.

In particular, students have the responsibility to observe standards of equity and respect in dealing with every member of the University community. This applies to all activities on UNSW premises and all external activities related to study and research. This includes behaviour in person as well as behaviour on social media, for example Facebook groups set up for the purpose of discussing UNSW courses or course work. Behaviour that is considered in breach of the Student Code Policy as discriminatory, sexually inappropriate, bullying, harassing, invading another's privacy or causing any person to fear for their personal safety is serious misconduct and can lead to severe penalties, including suspension or exclusion from UNSW.

If you have any concerns, you may raise them with your lecturer, or approach the [School Ethics Officer](#), [Grievance Officer](#), or one of the student representatives.

Academic Honesty and Plagiarism

Plagiarism is defined as using the words or ideas of others and presenting them as your own. UNSW and CSE treat plagiarism as academic misconduct, which means that it carries penalties as severe as being excluded from further study at UNSW. There are several on-line sources to help you understand what plagiarism is and how it is dealt with at UNSW:

- [Plagiarism and Academic Integrity](#)
- [UNSW Plagiarism Procedure](#)

Make sure that you read and understand these. Ignorance is not accepted as an excuse for plagiarism. In particular, you are also responsible that your assignment files are not accessible by anyone but you by setting the correct permissions in your CSE directory and code repository, if using. Note also that plagiarism includes paying or asking another person to do a piece of work for you and then submitting it as your own work.

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.

If you haven't done so yet, please take the time to read the full text of

- [UNSW's policy regarding academic honesty and plagiarism](#)

The pages below describe the policies and procedures in more detail:

- [Student Code Policy](#)

- [Student Misconduct Procedure](#)
- [Plagiarism Policy Statement](#)
- [Plagiarism Procedure](#)

You should also read the following page which describes your rights and responsibilities in the CSE context:

- [Essential Advice for CSE Students](#)

Course staff details

Lecturer in Charge: Lina Yao, lina.yao@unsw.edu.au

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