ELEC3042

Embedded Systems

Session 1, In person/Online-scheduled-weekday, North Ryde 2022

School of Engineering

Contents

General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
(130cp at 1000 level or above including ELEC2042 or ELEC242 or ELEC241 or MTRN2060 or ELEC260)

Corequisites

Co-badged status

Unit description
Project-based unit. Students complete a major project that emphasize aspects of digital computing systems, including state machines, digital data processing, arithmetic processing, timing, internal and external peripherals. Students will design a program for a microcontroller that will perform processing of real world data to achieve a defined aim. This programming exercise will be used to explore the complexities that make up digital hardware designs.

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: Describe the various components that comprise a modern embedded system, including those that are essential and those that are optional.

ULO2: Distinguish between the different external and internal interfaces and select which is most appropriate for a given circumstance.

ULO3: Interface a CPU with both internal and external functional units.

ULO4: Program an embedded system in either the assembly or C languages.

ULO5: Construct state machines on an embedded system

General Assessment Information

Grading and passing requirement for unit

There are two quizzes and two projects that need to be completed for assessment. 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).

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

Hurdle Requirements

Quiz 2 and the Major Project Defence are hurdle requirements. A grade of 50% or more is required in these assessments as a condition of passing this unit. If you are given a second opportunity to pass Quiz 2 as a result of failing to meet the minimum mark required, this opportunity will be made available after the close of Quiz 2. If you are given a second opportunity to re-take the Major Project Defence 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**.

Late submissions and Resubmissions

Online quizzes, in-class activities, or scheduled tests and exam must be undertaken at the time indicated in the unit guide. Should these activities be missed due to illness or misadventure, students may apply for Special Consideration.

All other assessments must be submitted by 5:00 pm Sydney time on their due date.

Should these assessments be missed due to illness or misadventure, students should apply for Special Consideration.

Assessments not submitted by the due date will receive a mark of zero.

Resubmission of work is not allowed.

Assessment Tasks

Name	Weighting	Hurdle	Due
Quiz 1	5%	No	Week 4
Minor project	20%	No	Week 7
Quiz 2	15%	Yes	Week 8
Major Project Design Review	15%	No	Week 9
Product Demonstration	20%	No	Week 11
Major Project Defence	25%	Yes	Week 12

Quiz 1

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 2 hours
Due: **Week 4**
Weighting: **5%**

Quiz 1 covers the work covered in the first few weeks of the unit. It ensures the foundation
information is grasped and any shortfalls are caught before the projects commence.

On successful completion you will be able to:

- Describe the various components that comprise a modern embedded system, including
  those that are essential and those that are optional.
- Distinguish between the different external and internal interfaces and select which is
  most appropriate for a given circumstance.

Minor project

Assessment Type [1]: Project
Indicative Time on Task [2]: 15 hours
Due: **Week 7**
Weighting: **20%**

The minor project allows the student to present a project that they have been working on. It is
used to provide experience for the major project, and is an important milestone to achieving the

learning outcomes.

Both the documentation and the code will be graded separately

On successful completion you will be able to:

- Interface a CPU with both internal and external functional units.

- Program an embedded system in either the assembly or C languages.

- Construct state machines on an embedded system

Quiz 2

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 2 hours
Due: **Week 8**
Weighting: **15%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This Quiz will be a reprise of the information learnt in the unit so far.

On successful completion you will be able to:

- Describe the various components that comprise a modern embedded system, including those that are essential and those that are optional.

- Distinguish between the different external and internal interfaces and select which is most appropriate for a given circumstance.

- Interface a CPU with both internal and external functional units.

- Program an embedded system in either the assembly or C languages.

Major Project Design Review

Assessment Type [1]: Design Task
Indicative Time on Task [2]: 15 hours
Due: **Week 9**
Weighting: **15%**

The design review requires the student to present their design for the major project. This design must be complete and will be verified during the final Major Project Defence,

On successful completion you will be able to:

- Distinguish between the different external and internal interfaces and select which is most appropriate for a given circumstance.
- Interface a CPU with both internal and external functional units.
- Construct state machines on an embedded system

Product Demonstration

Assessment Type [1]: Demonstration
Indicative Time on Task [2]: 13 hours
Due: **Week 11**
Weighting: **20%**

This is a public demonstration of the major project. Each student's code will be run on the provided system and a grade will be awarded based on functionality observed.

On successful completion you will be able to:

- Interface a CPU with both internal and external functional units.
- Program an embedded system in either the assembly or C languages.
- Construct state machines on an embedded system

Major Project Defence

Assessment Type [1]: Viva/oral examination
Indicative Time on Task [2]: 35 hours
Due: **Week 12**
Weighting: **25%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

In this defence the student must describe the final design and justify why it will solve the requirements of the major project. The design at this stage must be functionally complete and a prototype should be working.

On successful completion you will be able to:

- Distinguish between the different external and internal interfaces and select which is most appropriate for a given circumstance.

- Interface a CPU with both internal and external functional units.
- Program an embedded system in either the assembly or C languages.
- Construct state machines on an embedded system

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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

Lecture and practical sessions start in Week 1.

All in-person students need to be on campus in week 1. If you are an in-person student and are unable to be on campus for the start of week 1 please contact the unit convenor urgently. Online studnets will start with the provided zoom link in week 1.

All students will be expected to have an Arduino Uno and select electronic components. A kit of parts is available for purchase from the University at less than cost price, or the student can bring their own kit as long as it has an Arduino Uno and sufficient components. A list of required components will be supplied on iLearn.

Students will need a laptop computer with MPLab X IDE and Arduino software installed. It is preferable that the computer be running Windows 10. Students with Mac laptops are highly encouraged to install Boot Camp and run Windows 10 natively. You will also need Zoom.

A list of recommended textbooks can be found on Leganto or in iLearn. Students will also need to refer to component datasheets which will be provided on iLearn.

Unit Schedule

Refer to iLearn and lecture notes for the unit schedule.

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 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

Use of HW262 shield for practical work in Weeks 1 to 4.

There are now no marks attached to practical work.

Oral Defence 1 has been replaced with Major Project Design Review.

Quiz 2 is now a hurdle requirement.

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.	1

	1.3 In-depth understanding of specialist bodies of knowledge	1
	1.4 Discernment of knowledge development and research directions	
	1.5 Knowledge of engineering design practice	2
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	1,3,4,5
	2.2 Fluent application of engineering techniques, tools and resources.	4,5
	2.3 Application of systematic engineering synthesis and design processes.	4,5
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	
	3.2 Effective oral and written communication in professional and lay domains.	
	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	