ELEC3042

Embedded Systems

Session 1, Special circumstances 2021

School of Engineering

Contents

Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff
Convenor
Rex Di Bona
rex.dibona@mq.edu.au
Contact via via email
50 Waterloo Road
by Appointment

Convenor
Alan Kan
alan.kan@mq.edu.au
Contact via via email
50 Waterloo Road
by Appointment

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 both the assembly and C languages.

ULO5: Construct state machines on an embedded system

General Assessment Information

Grading and passing requirement for unit

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.

There is a hurdle requirement for both Defence 1 and Defence 2. If you do not satisfy the hurdle for either Defence you will be offered another chance to pass the respective Defence. This opportunity will occur in the week after the Defence took place.

Late submissions and Resubmissions

Unauthorized late submissions will attract a penalty of 20/100 marks per day. Extenuating circumstances will be considered upon lodgement of an application for special consideration or communication with the unit convenor.

Resubmissions of work are not allowed.

Assessment Tasks

Name	Weighting	Hurdle	Due
Product Demonstration	20%	No	Week 13
Week 12 Quiz	5%	No	Week 12
Diagnostic Quiz	5%	No	Week 2
Defence 2	20%	Yes	Weeks 11 and 12
Weekly Design Tasks	20%	No	Week 5
Minor project	10%	No	Week 6
Defence 1	20%	Yes	Weeks 7 and 8

Product Demonstration

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

This is a public demonstration of the major project. Each student will present their work and answer questions about the deign, implementation and functioning of their system.

On successful completion you will be able to:

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

Week 12 Quiz

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 2 hours
Due: **Week 12**
Weighting: **5%**

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 both the assembly and C languages.

Diagnostic Quiz

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

The diagnostic Quiz is a reference point that covers the pre-requisites for the unit and gives an indication whether you have the required pre-requisite knowledge.

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.

Defence 2

Assessment Type [1]: Viva/oral examination
Indicative Time on Task [2]: 20 hours
Due: **Weeks 11 and 12**
Weighting: **20%**
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 include the final state machine, as well as the programming constructs that will implement this state machine.

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 both the assembly and C languages.
- Construct state machines on an embedded system

Weekly Design Tasks

Assessment Type [1]: Design Implementation
Indicative Time on Task [2]: 20 hours
Due: **Week 5**
Weighting: **20%**

During the first weeks various background problems are to be investigated and solutions coded. These tasks will introduce the development system, and also cover some fundamental peripheral units that will be needed for the major project.

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 both the assembly and C languages.

Minor project

Assessment Type [1]: Project
Indicative Time on Task [2]: 10 hours
Due: **Week 6**
Weighting: **10%**

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.

On successful completion you will be able to:

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

Defence 1

Assessment Type [1]: Viva/oral examination
Indicative Time on Task [2]: 15 hours
Due: **Weeks 7 and 8**
Weighting: **20%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This is the first of the two defences for the unit. In this defence the student will defend their preliminary design. The design at this stage must include the state machine and the peripheral units that will be utilised to accomplish the major project

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

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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

All students will be expected to have an Arduino and selected electronic components. A kit of parts is available for less than cost price from the University (Link provided in ilearn), or the student can bring their own kit as long as it has sufficient components.

If circumstances require a kit may be borrowed from the Library for the duration of the unit. Please see one of the convenors for details.

The reference books for the unit are available through the library.

Practical sessions start in week 1.

Unit Schedule

The unit covers the theory and practice of Microcontrollers in embedded systems. We cover programming the core system, as well as using peripheral units. Programming state machines are covered, and form the basis of the minor and major work.

Please see ilearn for due date details.

Note that practical sessions start in week 1.

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
- Grade Appeal Policy
- Complaint Management 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

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 help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- 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

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

If you are a Global MBA student contact globalmba.support@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.

Changes from Previous Offering

The major and minor works are changing. The focus for the programming is on using the C programming language, rather than assembly language.