ELEC342

Computer Hardware

S1 Day 2018

Dept of Engineering

Contents

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General Information

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Credit points
3

Prerequisites
39cp at 100 level or above including (ELEC241 or ELEC242)

Corequisites

Co-badged status

Unit description
This unit is a sequence of lectures and practical work on digital circuits and systems, and their
application throughout digital computers, from the central processing unit to remote
peripherals. Students gain experience in using a range of techniques, including programmable
logic devices for constructing various computer sub-systems and a PC-based development
system for a small microcontroller (8-bit processor, digital and analogue I/O).

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:

Explain the internals of a Central Processing Unit

Compare and select between the different interface possibilities for a CPU

Interface a CPU with internal and external peripheral units

Program a microcontroller using assembler language

Construct complex state machines and implement these in software

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 to the *policies and procedures* section.

Hurdle Requirements

There are three hurdle requirements for passing this unit. The final examination is a hurdle requirement. A grade of 50% or more in the final examination is a condition for passing this unit. Each of the oral defenses is also a hurdle requirements. A grade of 50% or more for each oral defense is a condition for passing this unit.

Late submissions and Resubmissions

Late submissions will attract a penalty of 20/100 marks per day. Extenuating circumstances will be considered upon lodgement of a formal notice of *Special Consideration*.

Resubmissions of work are not allowed.

Assessment Tasks

Name	Weighting	Hurdle	Due
Diagnostic Quiz	5%	No	Week 3
Defense 1	20%	Yes	Week 9

Name	Weighting	Hurdle	Due
Defense 2	20%	Yes	Week 10
Product	20%	No	Week 13
Final Exam	35%	Yes	TBA

Diagnostic Quiz

Due: **Week 3**

Weighting: **5%**

A diagnostic quiz to show the current level of knowledge. This is compulsory, graded and feedback will be provided. The quiz is designed to provide feedback to the student about their readiness for this unit.

On successful completion you will be able to:

- Explain the internals of a Central Processing Unit

Defense 1

Due: **Week 9**

Weighting: **20%**

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

The student needs to engage in a 20 minute oral defense of their work.

This defense will cover the initial design of their project. It will include interface selection, peripheral comparison and state machine choices.

On successful completion you will be able to:

- Explain the internals of a Central Processing Unit
- Compare and select between the different interface possibilities for a CPU
- Program a microcontroller using assembler language
- Construct complex state machines and implement these in software

Defense 2

Due: **Week 10**

Weighting: **20%**

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

The student needs to engage in a 20 minute oral defense of their work.

This defense will cover the final design, including any changes from the initial design. All aspects of the design can be questioned during this task.

On successful completion you will be able to:

- Compare and select between the different interface possibilities for a CPU
- Interface a CPU with internal and external peripheral units
- Program a microcontroller using assembler language
- Construct complex state machines and implement these in software

Product

Due: **Week 13**
Weighting: **20%**

This component covers the final result of the course. Each group needs to present their final work. Marks will be awarded based on understanding of their product, integration of the requirements of their product with the capabilities of the hardware available, understanding of how their requirements utilise the computer hardware to produce the final solution.

Questions will be asked about the design and implementation of the final product. Students should have prepared information documenting their design choices and the implementation of the product.

The lab workbook will be examined during this task.

On successful completion you will be able to:

- Compare and select between the different interface possibilities for a CPU
- Interface a CPU with internal and external peripheral units
- Program a microcontroller using assembler language
- Construct complex state machines and implement these in software

Final Exam

Due: **TBA**
Weighting: **35%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

The final exam will cover all the lectures and laboratory work. It will be a 3 hour closed book exam. You will be expected to be able to read and comprehend code snippets and design hardware to perform certain tasks.

On successful completion you will be able to:

- Explain the internals of a Central Processing Unit

- Compare and select between the different interface possibilities for a CPU
- Interface a CPU with internal and external peripheral units

Delivery and Resources

Lectures	There is one lecture per week. Currently it is scheduled for Wednesday 4-6pm. Attendance is highly recommended at all lectures. Announcements and feedback will be made in lectures.
Laboratory Sessions	There are 12 laboratory sessions, starting in week 2. Students must attend their assigned laboratory session in week 2. Thereafter students may attend none, any or all laboratory sessions. You should preferably attend the same session as the rest of your group.
	How this works will be explained in Lecture 1. Your group will be created in week 2 and will be provided with the hardware materials for this unit.
	This unit will use Atmel Studio 7, and the Arduino Development IDE 1.8.5. These will be provided on laboratory systems, or may be installed on a personal Microsoft Windows based PC for use outside normal laboratory times.
	Food and drink are not permitted in the laboratory. Students will not be permitted to enter the laboratory without appropriate footwear. Thongs and sandals are not acceptable.
Laboratory Note Book	Each student is required to have a bound laboratory notebook. This book must have all required pre-work recorded. It must also contain all your development work during the project, and must be made available during the oral defenses.
Reports	There are two 20 minute oral defenses due during the unit. These must be booked in advance and must be completed before weeks 9 and 10 respectively.
	There is a group report due in week 13 that will demonstrate the final product.
Text Book	None
Notes	Notes for the course will be available on ilearn. Each student is required to preview the corresponding notes before each practical session.
Recommended Reading	These will be made available in the lectures. Each student will be expected to download the data sheets for the microcontroller and the manual for Atmel Studio 7.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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 *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results shown in *iLearn*, 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.

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 improve your marks and take control of your study.

- Workshops

- StudyWise

- Academic Integrity Module for Students

- Ask a Learning Adviser

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

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Interface a CPU with internal and external peripheral units
- Program a microcontroller using assembler language
- Construct complex state machines and implement these in software

Assessment tasks

- Defense 1
- Defense 2
- Product
- Final Exam

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Compare and select between the different interface possibilities for a CPU
- Construct complex state machines and implement these in software

Assessment tasks

- Defense 1

- Defense 2

- Product

- Final Exam

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Explain the internals of a Central Processing Unit

- Interface a CPU with internal and external peripheral units

- Construct complex state machines and implement these in software

Assessment tasks

- Diagnostic Quiz

- Defense 1

- Defense 2

- Product

- Final Exam

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Explain the internals of a Central Processing Unit

- Compare and select between the different interface possibilities for a CPU

- Interface a CPU with internal and external peripheral units

- Program a microcontroller using assembler language

- Construct complex state machines and implement these in software

Assessment tasks

- Diagnostic Quiz
- Defense 1
- Defense 2
- Product
- Final Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Explain the internals of a Central Processing Unit
- Compare and select between the different interface possibilities for a CPU
- Interface a CPU with internal and external peripheral units
- Program a microcontroller using assembler language
- Construct complex state machines and implement these in software

Assessment tasks

- Diagnostic Quiz
- Defense 1
- Defense 2
- Product
- Final Exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Explain the internals of a Central Processing Unit

- Compare and select between the different interface possibilities for a CPU

- Interface a CPU with internal and external peripheral units

- Program a microcontroller using assembler language

- Construct complex state machines and implement these in software

Assessment tasks

- Defense 1

- Defense 2

- Product

- Final Exam

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Explain the internals of a Central Processing Unit

- Construct complex state machines and implement these in software

Assessment tasks

- Diagnostic Quiz

- Defense 1

- Defense 2

- Product

- Final Exam

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- Compare and select between the different interface possibilities for a CPU

Assessment tasks

- Defense 1
- Defense 2
- Product
- Final Exam

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcome

- Compare and select between the different interface possibilities for a CPU

Assessment tasks

- Defense 1
- Defense 2
- Product
- Final Exam

Changes from Previous Offering

This offering will use a different teaching methodology, different microcontroller, different teaching board and different marking scheme.

We will have most sessions using a flipped teaching methodology. Each student will have a goal and work towards that goal at their own pace. Staff will be available during scheduled times to assist with any queries as needed. Lecture slots will consist of Q and A sessions and mini lectures about specific topics.

The microcontroller that will be used in the course has been changed to an ATMEL ATmega328p. It is provided as an Arduino uno board, although we will not be taking advantage directly of the Arduino ecosystem. It has a modern instruction set, and takes advantage of changes in technology from previous microcontrollers utilised in this course..