



**MONASH** University  
Information Technology

**FIT2069**  
**Computer architecture**

**Unit Guide**

**Semester 1, 2012**

The information contained in this unit guide is correct at time of publication. The University has the right to change any of the elements contained in this document at any time.

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# **FIT2069 Computer architecture - Semester 1, 2012**

This unit covers the internal mechanism of computers and how they are organised and programmed. Topics include combinatorial and sequential logic, Boolean Algebra, Karnaugh maps, counters, ripple adders, tree adders, memory/addressing, busses, speed, DMA, data representation, machine arithmetic, microprogramming, caches and cache architectures, virtual memory and translation look-aside buffers, vectored interrupts, polled interrupts, pipelined architecture, superscalar architecture, data dependency, hazards, CISC, RISC, VLIW machine architectures.

## **Mode of Delivery**

Clayton (Day)

## **Contact Hours**

2 hrs lectures/wk, 3 hr laboratory/fortnight, 2 hr tutorial/fortnight

## **Workload**

- Lectures: 2 hrs per week
- Laboratory: 3 hrs per fortnight
- Tutorial: 2 hrs per fortnight

This is a technically oriented unit where content in any given week depends strongly on content in preceding weeks. Therefore students should plan and commit a minimum of 8 to 12 hours for personal study every week and should allocate up to 5 hours per week in some weeks for use of a computer. Laboratory work will require preparation before attendance.

The unit content requires a strong focus on understanding content through the semester.

## **Unit Relationships**

### **Prerequisites**

FIT1031 or FIT1001 and FIT1008 or FIT1015

### **Chief Examiner**

Dr Carlo Kopp

### **Campus Lecturer**

### **Clayton**

**A/Prof Andrew Paplinski, consultation by appointment**

# Academic Overview

## Outcomes

At the completion of this unit students will have -  
A knowledge and understanding of:

- combinatorial and sequential logic, Boolean Algebra, Karnaugh maps, and hazards;
- counters, ripple adders, tree adders, memory/addressing, computer busses, logic and bus speed, and Direct Memory Access;
- data representation for integers and floating point operands;
- machine arithmetic, microprogramming;
- storage hierarchies, caches and cache architectures, performance impact of caching;
- virtual memory and translation look-aside buffers, performance impact of TLB caching;
- vectored and polled interrupt handling;
- pipelined architecture, superscalar architecture, data dependency, and hazards;
- CISC, RISC, VLIW machine architectures.

Developed the skills to:

- model combinatorial and sequential logic circuits using a simulator tool;
- perform programming tasks in assembly code.

## Graduate Attributes

Monash prepares its graduates to be:

1. responsible and effective global citizens who:
  - a. engage in an internationalised world
  - b. exhibit cross-cultural competence
  - c. demonstrate ethical values

critical and creative scholars who:

- a. produce innovative solutions to problems
- b. apply research skills to a range of challenges
- c. communicate perceptively and effectively

## Assessment Summary

Examination (3 hours): 60%; In-semester assessment: 40%

Assessment Task	Value	Due Date
Laboratory Exercises	Total 30% (5% each)	In weeks 2, 4, 6, 8, 10 and 12
Tutorial Exercises	Total 10% (1.667% each)	In weeks 1, 3, 5, 7, 9 and 11
Examination 1	60%	To be advised

## Teaching Approach

- **Lecture and tutorials or problem classes**

This teaching and learning approach provides facilitated learning, practical exploration and peer learning.

- **Laboratory-based classes**

This teaching approach is practical learning.

## Feedback

### Our feedback to You

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Test results and feedback

### Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through SETU, Student Evaluation of Teacher and Unit. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, and on student evaluations, see:

<http://www.monash.edu.au/about/monash-directions/directions.html>

<http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html>

## Previous Student Evaluations of this unit

Based on extensive student feedback in Sem 1 2011 more tutorial time was requested. Fortnightly tutorials are now 2 hours (up from one hour).

If you wish to view how previous students rated this unit, please go to

<https://emuapps.monash.edu.au/unitevaluations/index.jsp>

## Recommended Resources

Logisim software (free)

Xspim/Spim software (free)

## Examination material or equipment

Non-programmable scientific calculators will be permitted.

## Unit Schedule

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1	Intro/History/Background; Boolean Algebra	Tutorial 1
2	Karnaugh maps, Hazards; Data Representation	Laboratory 1
3	Counters, Adders, Shifters, Sequential Logic	Tutorial 2
4	Basic Machine Organisation	Laboratory 2
5	Control Unit Design	Tutorial 3
6	Instruction Sets and Design	Laboratory 3
7	I/O, Interrupts, DMA	Tutorial 4
8	Cache Organisation	Laboratory 4
9	Mass Storage/Memory Management	Tutorial 5
10	CPU Organisation/Pipelined Architectures	Laboratory 5
11	Superscalar Architectures	Tutorial 6
12	CISC, RISC, VLIW, Other Machine Architectures	Laboratory 6
	SWOT VAC	No formal assessment is undertaken SWOT VAC
	Examination period	LINK to Assessment Policy: <a href="http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html">http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html</a>

\*Unit Schedule details will be maintained and communicated to you via your MUSO (Blackboard or Moodle) learning system.

# Assessment Requirements

## Assessment Policy

Faculty Policy - Unit Assessment Hurdles

(<http://www.infotech.monash.edu.au/resources/staff/edgov/policies/assessment-examinations/unit-assessment-hu>)

## Assessment Tasks

### Participation

There are 6 Tutorial Exercises each worth 1.667% of the total mark (assessed).

There are 6 Laboratory Exercises each worth 5% of the total mark (assessed, preparation required).

Tutorials and Laboratories are scheduled in alternating weeks.

Attendance is expected and strongly recommended. This unit is tightly integrated so if students miss a Tutorial or Laboratory they will have difficulty understanding later material.

#### • Assessment task 1

**Title:**

Laboratory Exercises

**Description:**

6 Laboratory Exercises. Individual assessment per task. Preparation required.

Attendance is expected and strongly recommended. This unit is tightly integrated so if students miss a Laboratory they will have difficulty understanding later material.

**Weighting:**

Total 30% (5% each)

**Criteria for assessment:**

The criteria used to assess laboratory tasks are:

1. All programs must assemble and execute correctly. Evidence of testing is required.
2. Programs must meet the problem specification.
3. Assembly code should be readable and maintainable.
4. Programs should be documented.
5. All algorithms should follow the style presented in laboratory examples and be correct.
6. Logic simulator circuits must comply with the specified truth table or other functional definition.

**Due date:**

In weeks 2, 4, 6, 8, 10 and 12

#### • Assessment task 2

**Title:**

Tutorial Exercises

**Description:**

6 Tutorial Exercises. Individual assessment per task.

## Assessment Requirements

Attendance is expected and strongly recommended. This unit is tightly integrated so if students miss a Tutorial they will have difficulty understanding later material.

### **Weighting:**

Total 10% (1.667% each)

### **Criteria for assessment:**

The criteria used to assess submissions are:

1. Correctness and understanding - there may be more than one "right" answer in many cases. We will look for answers that reflect understanding of the underlying principles and theories.
2. Completeness - that you have answered all parts of each question.
3. Presentation - that you have presented your answers in a suitably formatted style.
4. Use of evidence and argument - you are able to explain your position by using logical argument drawing on the theory presented in the unit.

### **Due date:**

In weeks 1, 3, 5, 7, 9 and 11

## Examinations

### • Examination 1

#### **Weighting:**

60%

#### **Length:**

3 hours

#### **Type (open/closed book):**

Closed book

#### **Electronic devices allowed in the exam:**

Non-programmable scientific calculators will be permitted.

## Assignment submission

It is a University requirement

(<http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-procedures.html>) for students to submit an assignment coversheet for each assessment item. Faculty Assignment coversheets can be found at <http://www.infotech.monash.edu.au/resources/student/forms/>. Please check with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the online assignment submission, hand-in a hard copy, or use an online quiz).

## Online submission

If Electronic Submission has been approved for your unit, please submit your work via the VLE site for this unit, which you can access via links in the my.monash portal.

## Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process:

<http://www.infotech.monash.edu.au/resources/student/equity/special-consideration.html>.



## **Returning assignments**

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

## Other Information

### Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:

<http://policy.monash.edu.au/policy-bank/academic/education/index.html>

Key educational policies include:

- Plagiarism  
(<http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-policy.html>)
- Assessment  
(<http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-p>)
- Special Consideration  
(<http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.h>)
- Grading Scale  
(<http://www.policy.monash.edu/policy-bank/academic/education/assessment/grading-scale-policy.html>)
- Discipline: Student Policy  
(<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-discipline-policy.html>)
- Academic Calendar and Semesters (<http://www.monash.edu.au/students/key-dates/>);
- Orientation and Transition (<http://www.infotech.monash.edu.au/resources/student/orientation/>);  
and
- Academic and Administrative Complaints and Grievances Policy  
(<http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy>)
- Codes of Practice for Teaching and Learning  
(<http://www.policy.monash.edu.au/policy-bank/academic/education/conduct/suppdocs/code-of-practice-tea>)

### Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at [www.monash.edu.au/students](http://www.monash.edu.au/students). For Sunway see <http://www.monash.edu.my/Student-services>, and for South Africa see <http://www.monash.ac.za/current/>

The Monash University Library provides a range of services and resources that enable you to save time and be more effective in your learning and research. Go to <http://www.lib.monash.edu.au> or the library tab in my.monash portal for more information. At Sunway, visit the Library and Learning Commons at <http://www.lib.monash.edu.my/>. At South Africa visit <http://www.lib.monash.ac.za/>.

Academic support services may be available for students who have a disability or medical condition. Registration with the Disability Liaison Unit is required. Further information is available as follows:

- Website: <http://monash.edu/equity-diversity/disability/index.html>;
- Email: [dlu@monash.edu](mailto:dlu@monash.edu)
- Drop In: Equity and Diversity Centre, Level 1 Gallery Building (Building 55), Monash University, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Sunway Campus
- Telephone: 03 9905 5704, or contact the Student Advisor, Student Community Services at 03 55146018 at Sunway

Other Information

## Reading list

### Recommended Reading:

William Stallings, Computer Organization and Architecture: Designing for Performance, 8/E, Prentice Hall, ISBN-13: 9780136073734

Morris Mano and Charles Kime, Logic and Computer Design Fundamentals 4/E, Pearson Prentice Hall, ISBN 0-13-140539-X

### Supplementary Recommended Reading:

<http://www.csse.monash.edu.au/~carlo/SYSTEMS/>