



MONASH University
Information Technology

FIT5174
Parallel and distributed systems

Unit Guide

Semester 2, 2011

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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FIT5174 Parallel and distributed systems - Semester 2, 2011

Modern computer systems contain parallelism in both hardware and software. This unit covers parallelism in both general purpose and application specific computer architectures and the programming paradigms that allow parallelism to be exploited in software. This unit examines both shared memory and message passing paradigms in both hardware and software; concurrency, multithreading and synchronicity; parallel, clustered and distributed supercomputing models and languages. Students will program in these paradigms.

Mode of Delivery

Caulfield (Day)

Contact Hours

2 hrs lectures/wk

Workload

Workload commitments per week are:

- two-hour lecture
- one-hour unsupervised lab in the B-block (B3.48B, Caulfield) to study the background material and to work on assignments.
- up to 3 hours per week of preparation including lecture material
- up to 3 hours per week surveying existing literature in the library, on-line resources etc; hands-on lab exercises
- a minimum of 3 hours per week personal study in order to satisfy the reading and assignment expectations

Unit Relationships

Prohibitions

CSE4333

Prerequisites

Recommended knowledge: operating systems, including synchronisation and interprocess communication mechanisms; advanced computer architecture, including pipelining techniques.

Chief Examiner

Dr Asad Khan

Campus Lecturer

Clayton

Dr Asad Khan

Contact hours: Thu 1PM-3PM, Room 221, Building 63, Clayton or by appointment at Caulfield

Academic Overview

Learning Objectives

At the completion of this unit students will have:

- knowledge of a variety of parallel architectures, such as bus-based, massively parallel, cluster, vector;
- knowledge of a variety of parallel programming paradigms, synchronisation and parallelisation primitives, message passing, data parallel, tuple space;
- understanding of concurrency, synchronicity and parallelism;
- understanding of the design issues of parallel systems;
- skills in designing, developing and debugging parallel programs using a variety of paradigms.

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

Assignments: 100%

Assessment Task	Value	Due Date
Assignment 1 (Distributed Systems)	25%	Monday 22 August 2011, 12PM (week05)
Assignment 2 (Distributed Systems)	25%	Monday 19 September 2011, 12PM (week09)
Assignment 3 (Parallel Architectures)	25%	Friday 15 October 2011, 12PM (week12)
Parallel architectures class test (during the lecture)	25%	Week 12 lecture slot

Teaching Approach

Lecture and tutorials or problem classes

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

Feedback

Our feedback to You

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

- Graded assignments with comments

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

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

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

Required Resources

Access to a personal computer with VMPlayer (Freeware) or VMWare Workstation (VmWare Fusion for Mac users) software is highly recommended.

This is freely available in University computer labs

Unit Schedule

Week	Activities	Assessment
0	Unit Introduction on web (no lecture)	No formal assessment or activities are undertaken in week 0
1	Distributed systems	
2	Interprocess communication and remote procedure call	
3	Message Passage Library (MPI)	
4	Synchronisation, MUTEX, Deadlocks	
5	Election Algorithms, Distributed Transactions, Concurrency Control	Assignment 1 (Distributed Systems) due on Monday 22 August, 2011 12PM
6	(1) Faults, Distributed Consensus, and Security (2) Parallel Computing	
7	Instruction Level Parallelism	
8	Vector Architecture	
9	(1) Data Parallel Architectures (2) SIMD Architectures	Assignment 2 (Distributed Systems) due on Monday 19 September, 2011 12PM
10	(1) Introduction to MIMD (2) Distributed Memory MIMD Architectures	
11	Super Scaler Processing	
12	Parallel Architectures Class Test (during the lecture)	Assignment 3 (Parallel Architectures) due on Monday 17 October 2011 12PM; Parallel architectures class test during lecture.
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period	LINK to Assessment Policy: http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html

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

Assessment Requirements

Assessment Tasks

Participation

- **Assessment task 1**

Title:

Assignment 1 (Distributed Systems)

Description:

A theoretical assignment in the form of a research paper. The students will demonstrate their understanding of multi-process algorithms by researching and writing about their selected topics.

Weighting:

25%

Criteria for assessment:

Individual assessment. Marks will be allocated, roughly equally, against the application areas listed in the assignment specification. Further marks will be allocated for the length of the paper (against the word limit) and the number and quality of references.

Due date:

Monday 22 August 2011, 12PM (week05)

- **Assessment task 2**

Title:

Assignment 2 (Distributed Systems)

Description:

Write parallel programs using the message passing programming model. The students will demonstrate their practical skills in developing parallel distributed applications through this assessment.

Weighting:

25%

Criteria for assessment:

Individual assessment. This work will be assessed on a mix of programming tasks and theoretical write-up. Approximately 90% of the total marks for this assessment will be allocated to the programming related tasks and the remaining 10% for the theoretical write-up.

Due date:

Monday 19 September 2011, 12PM (week09)

- **Assessment task 3**

Title:

Assignment 3 (Parallel Architectures)

Description:

A research paper on two contemporary computer architectures by focussing on hardware parallelism.

Weighting:

25%

Criteria for assessment:

Assessment Requirements

Individual assessment. Marks will be allocated, roughly equally, against the application areas listed in the assignment specification. Further marks will be allocated for the length of the paper (against the word limit) and the number and quality of references.

Due date:

Friday 15 October 2011, 12PM (week12)

• **Assessment task 4**

Title:

Parallel architectures class test (during the lecture)

Description:

Students will be given a 60 minutes class test, based on the parallel architecture lecture notes, comprising several short questions.

Weighting:

25%

Criteria for assessment:

Individual work. It will be a closed book test.

Due date:

Week 12 lecture slot

Examinations

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).

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

Resubmission of assignments

Re-submission of assignments will not be allowed.

Referencing requirements

Formatting and referencing information will provided on the unit website.

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. 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. Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis

- Website: <http://adm.monash.edu/sss/equity-diversity/disability-liaison/index.html>;
- Telephone: 03 9905 5704 to book an appointment with a DLO;
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1 Gallery Building (Building 55), Monash University, Clayton Campus.

Reading material including research papers, programming manuals and system specifications, will be distributed electronically as part of the background reading material for each week.

In addition to the above the students can supplement their knowledge of the unit areas through the following

Recommended Reading List

Other Information

G.R. Andrews: Foundations of Multithreaded, Parallel and Distributed Programming, Addison-Wesley, 2000.

J. Magee and J. Kramer: Concurrency: State models & Java Programming; John-Wiley & Sons, 2006.

I.T. Foster: Designing and Building Parallel Programs, Addison-Wesley, 1995.

M. Maekawa, A.E. Oldehoeft, R.R. Oldehoeft: Operating Systems Advanced Concepts, Benjamin/Cummings, 1987.

Advanced Computer Architectures: A Design Space Approach, Sima, Fountain and Kacsuk , Addison Wesley Publishers