



MONASH University

**FIT5174**  
**Parallel and distributed systems**

**Unit Guide**

**Semester 2, 2009**

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.

*Last updated : 29 Jul 2009*

# Table of Contents

<u>FIT5174 Parallel and distributed systems - Semester 2, 2009</u> .....	1
<u>Chief Examiner</u> .....	1
<u>Lecturer(s) / Leader(s)</u> .....	1
<u>Clayton</u> .....	1
<u>Additional communication information</u> .....	1
<u>Introduction</u> .....	2
<u>Unit synopsis</u> .....	2
<u>Learning outcomes</u> .....	2
<u>Contact hours</u> .....	2
<u>Workload</u> .....	2
<u>Unit relationships</u> .....	2
<u>Prerequisites</u> .....	2
<u>Prohibitions</u> .....	3
<u>Relationships</u> .....	3
<u>Teaching and learning method</u> .....	4
<u>Timetable information</u> .....	4
<u>Tutorial allocation</u> .....	4
<u>Unit Schedule</u> .....	4
<u>Unit Resources</u> .....	6
<u>Prescribed text(s) and readings</u> .....	6
<u>Recommended text(s) and readings</u> .....	6
<u>Equipment and consumables required or provided</u> .....	6
<u>Study resources</u> .....	6
<u>Assessment</u> .....	8
<u>Overview</u> .....	8
<u>Faculty assessment policy</u> .....	8
<u>Assignment tasks</u> .....	8
<u>Due dates and extensions</u> .....	9
<u>Late assignment</u> .....	10
<u>Return dates</u> .....	10
<u>Appendix</u> .....	11

# **FIT5174 Parallel and distributed systems - Semester 2, 2009**

## **Chief Examiner:**

**Dr Sita Ramakrishnan**

Senior Lecturer

Phone: +61 3 990 58689

Fax: +61 3 990 55159

## **Lecturer(s) / Leader(s):**

### **Clayton**

**Mr Quazi Mamun**

**Dr Asad Khan**

Fax: +61 3 990 55159

## **Additional communication information:**

Mr Quazi Mamun - Distributed Systems component

Dr Asad Khan - Parallel architectures component

## Introduction

Welcome to FIT5174. This 6 point unit comprises two modules - *Parallel architectures* and *Distributed Systems*. Each of these two modules caters for half of the lectures, work and assessment of FIT5174.

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.

## Unit synopsis

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.

## Learning outcomes

At the completion of this unit students will have:

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

## Contact hours

2 hours of lectures/week; 1 hour of tutorials/week.

## Workload

Workload commitments for FIT5174 are:

- two-hour lecture
- one-hour unsupervised tute in the MUSE lab (G.13/Bldg 26, Clayton) to work on assignments, any hurdles etc, and contact lecturer on campus if required
- upto 3 hours / week of preparation/personal study including lecture material
- upto 3 hours / week surveying existing literature in the library, on-line resources etc; hands-on lab exercises
- a minimum of 4 hours / week per 2 hour contact time in order to satisfy the reading and assignment expectations

## Unit relationships

### Prerequisites

For MAIT students, [FIT9017](#), [FIT9018](#), [FIT9019](#), [FIT9030](#), [FIT9020](#) and [FIT4037](#). Recommended knowledge: operating systems, including synchronization and interprocess communication mechanisms; advanced computer

FIT5174 Parallel and distributed systems - Semester 2, 2009

architecture, including pipelining techniques.

## **Prohibitions**

FIT4001 and CSE4333.

## **Relationships**

FIT5174 is a core unit for Software Engineering Specialisation in the MIT and MAIT and an elective for all FIT masters.

Before attempting this unit you must have satisfactorily completed

FIT2022, or CSE2302 and CSE2/3324; in addition students must have completed 24 points of level 3 units, or equivalent.

You should have knowledge of

Types of parallelism within a computer architecture; processes, scheduling, inter-process communication; and experience with multiple programming languages.

You may not study this unit and Translation unit CSE4333 in your degree.

## Teaching and learning method

FIT5174 provides students with a comprehensive set of study guides and references to facilitate your learning. The lectures will build on these teaching resources rather than reproduce them, and are an opportunity for you to raise questions.

**Lectures:** You are advised to read through the study guide prior to the lecture, as two hours is far too short to cover all the important concepts. Emphasis in lectures will be given to providing examples of the concepts and discussing some of the questions that these ideas may provoke.

Students are strongly encouraged to attend the lectures and participate in the discussions.

Some of the assignment work in the Distributed systems component will be team based and peer assessed for some aspects.

## Timetable information

For information on timetabling for on-campus classes please refer to MUTTS, <http://mutts.monash.edu.au/MUTTS/>

## Tutorial allocation

On-campus students should register for tutorials/laboratories using the Allocate+ system:  
<http://allocate.cc.monash.edu.au/>

## Unit Schedule

Week	Topic	Study guide	References/Readings	Key dates
1	Distributed systems - Introduction to Concurrency & parallelism, Java's model of concurrency with built-in model of monitor, Shared memory synchronisation - week 1	Materials on FIT4001/FIT5174 Blackboard site	Refer to Blackboard site for references to Chapters in the Topic column for Parallel architectures	
2	Distributed systems - Shared memory synchronisation (contd), Monitors and deadlocks - week 2	Materials on FIT4001/FIT5174 Blackboard site		
3	Distributed systems - concurrent program analysis - Deadlock, Safety & Liveness properties - week 3	Materials on FIT4001/FIT5174 Blackboard site		
4	Distributed systems - Message passing concepts - week 4	Materials on FIT4001/FIT5174 Blackboard site		
5	Distributed systems - Principles and Issues in	Materials on FIT4001/FIT5174		Distributed systems assignment 1 due

FIT5174 Parallel and distributed systems - Semester 2, 2009

	Message passing programming, Synchronous & asynchronous semantics -Case study - MPI, Java, Linda - week 5	Blackboard site		Monday Aug 17th 5pm.
6	Distributed systems - Parallel programming libraries - week 6	Materials on FIT4001/FIT5174 Blackboard site		
7	Parallel Architectures Lectures - Review of instruction level pipelining - Chapters 4 & 7 - week 7	Materials on FIT4001/FIT5174 Blackboard site	Refer to Blackboard site for references to Chapters in the Topic column for Parallel architectures	
8	Parallel Architectures Lectures -Review of instruction level pipelining - Chapter 7 - week 8	Materials on FIT4001/FIT5174 Blackboard site		
9	Introduction to Parallel Architectures - Chapter 10 SIMD Architectures - Chapter 11 Vector Architectures - Chapter 14 VLIW Architectures - Chapter 6 Introduction to MIMD - week 9	Materials on FIT4001/FIT5174 Blackboard site		Distributed systems assignment 2 due Monday September 14th 5pm.
10	Distributed Memory MIMD Architectures - Chapter 17 - week 10	Materials on FIT4001/FIT5174 Blackboard site		Parallel architectures assignment 3 due Friday 25th September, 12PM
Mid semester break				
11	Shared Memory MIMD Architectures - Chapter 18 - week 11	Materials on FIT4001/FIT5174 Blackboard site		
12	Parallel architectures - week 12	Materials on FIT4001/FIT5174 Blackboard site		Parallel architectures Quiz, Mon 12/Oct, 12PM
13	Week 13 - Review session			Parallel architectures assignment 4 due Friday 23rd October, 12PM

## Unit Resources

### Prescribed text(s) and readings

#### Recommended Reading

Reading material including research papers, programming manuals and system specifications, will be distributed electronically or in hardcopy.

#### Reference Material:

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

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. }

Text books are available from the [Monash University Book Shops](#). Availability from other suppliers cannot be assured. The Bookshop orders texts in specifically for this unit. You are advised to purchase your text book early.

### Recommended text(s) and readings

#### Recommended Reading

Reading material including research papers, programming manuals and system specifications, will be distributed electronically or in hardcopy.

#### Reference Material:

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

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. }

### Equipment and consumables required or provided

Students studying off-campus are required to have the [minimum system configuration](#) specified by the Faculty as a condition of accepting admission, and regular Internet access. On-campus students, and those studying at supported study locations may use the facilities available in the computing labs. Information about computer use for students is available from the ITS Student Resource Guide in the Monash University Handbook. You will need to allocate up to **n** hours per week for use of a computer, including time for newsgroups/discussion groups.

### Study resources

Study resources we will provide for your study are:

Study resources we will provide for your study are:

FIT5174 Parallel and distributed systems - Semester 2, 2009

- Weekly detailed lecture notes outlining the learning objectives, discussion of the content, required readings and exercises;
- Weekly exercises - refer to relevant chapters in Andrews & Magee's Text for Distributed Systems' component ;
- Assignment specifications;
- Discussion groups;
- This Unit Guide outlining the administrative information for the unit;
- The unit web site on MUSO, where resources outlined above will be made available.

## Assessment

### Overview

Essay: 20%; Assignments: 40%; Exam - Department (2 hours): 40%.

### Faculty assessment policy

To pass a unit which includes an examination as part of the assessment a student must obtain:

- 40% or more in the unit's examination, and
- 40% or more in the unit's total non-examination assessment, and
- an overall unit mark of 50% or more.

If a student does not achieve 40% or more in the unit examination or the unit non-examination total assessment, and the total mark for the unit is greater than 44% then a mark of no greater than 44-N will be recorded for the unit.

The two hour departmental examination has been replaced with a class test and a different mark distribution for the assignments owing to this unit being co-taught with FIT4001 in this semester.

### Assignment tasks

#### Assignment coversheets

Assignment coversheets are available via "Student Forms" on the Faculty website:

<http://www.infotech.monash.edu.au/resources/student/forms/>

You MUST submit a completed coversheet with all assignments, ensuring that the plagiarism declaration section is signed.

**Assignment submission and return procedures, and assessment criteria will be specified with each assignment.**

#### • Assignment task 1

**Title:**

Distributed Systems - Assignment 1

**Description:**

Assignment spec on Blackboard site for the unit.

**Weighting:**

25%

**Due date:**

Distributed systems assignment 1 due Week 5 - Monday Aug 17th 5pm

#### • Assignment task 2

**Title:**

Distributed Systems - Programming Assignment 2

**Description:**

Write parallel programs using message passing. Assignment spec on Blackboard site for the unit.

**Weighting:**

25%

**Due date:**

Distributed systems assignment 2 due - Monday September 14th 5pm

- **Assignment task 3**

**Title:**

Parallel architectures - Assignment 3

**Description:**

In this assignment you are asked to write a research paper on how high performance machines are applied to a range of different application areas. You should read sufficient material to give you some understanding of the outcomes for the area, and the underlying computational methods (for example, the numerical methods involved, or the computer science algorithms employed) and how it is solved using a high performance computer.

**Weighting:**

20%

**Due date:**

- **Assignment task 4**

**Title:**

Parallel architectures - Assignment 4

**Description:**

In this assignment you are to write a research paper on various multi-core architectures and discuss the design choices and alternatives available in the current commercial products.

**Weighting:**

20%

**Due date:**

Week 13 - 23/Oct, 12PM

- **Assignment task 5**

**Title:**

Week 12 Quiz

**Description:**

Students will be given a 30 minutes quiz on materials presented in the lectures from week 7 to week 11 during week 12's lecture.

**Weighting:**

10%

**Due date:**

**Remarks:**

Week 12 lecture slot

## Due dates and extensions

Please make every effort to submit work by the due dates. It is your responsibility to structure your study program around assignment deadlines, family, work and other commitments. Factors such as normal work pressures, vacations, etc. are not regarded as appropriate reasons for granting extensions. Students are advised to NOT assume that granting of an extension is a matter of course.

Students requesting an extension for any assessment during semester (eg. Assignments, tests or presentations) are required to submit a Special Consideration application form (in-semester exam/assessment task), along with original copies of supporting documentation, directly to their lecturer within two working days before the assessment submission deadline. Lecturers will provide specific outcomes directly to students via email within 2 working days. The lecturer reserves the right to refuse late applications.

A copy of the email or other written communication of an extension must be attached to the assignment submission.

Refer to the Faculty Special consideration webpage or further details and to access application forms:  
<http://www.infotech.monash.edu.au/resources/student/equity/special-consideration.html>

## **Late assignment**

Assignments received after the due date will be subject to a penalty **for late submission as described in the MUSO site for cse4333 assignments.**

## **Return dates**

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

## Appendix

Please visit the following URL: <http://www.infotech.monash.edu.au/units/appendix.html> for further information about:

- Continuous improvement
- Unit evaluations
- Communication, participation and feedback
- Library access
- Monash University Studies Online (MUSO)
- Plagiarism, cheating and collusion
- Register of counselling about plagiarism
- Non-discriminatory language
- Students with disability
- End of semester special consideration / deferred exams