# Table of Contents

FIT5174 Parallel and distributed systems - Semester 2, 2014

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of Delivery</td>
<td>1</td>
</tr>
<tr>
<td>Workload Requirements</td>
<td>1</td>
</tr>
<tr>
<td>Additional workload requirements</td>
<td>1</td>
</tr>
<tr>
<td>Unit Relationships</td>
<td>2</td>
</tr>
<tr>
<td>Prohibitions</td>
<td>2</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>2</td>
</tr>
<tr>
<td>Chief Examiner</td>
<td>2</td>
</tr>
<tr>
<td>Campus Lecturer</td>
<td>2</td>
</tr>
<tr>
<td>Caulfield</td>
<td>2</td>
</tr>
<tr>
<td>Tutors</td>
<td>2</td>
</tr>
<tr>
<td>Caulfield</td>
<td>2</td>
</tr>
<tr>
<td>Your feedback to Us</td>
<td>2</td>
</tr>
<tr>
<td>Previous Student Evaluations of this Unit</td>
<td>3</td>
</tr>
<tr>
<td>Academic Overview</td>
<td>4</td>
</tr>
<tr>
<td>Learning Outcomes</td>
<td>4</td>
</tr>
<tr>
<td>Unit Schedule</td>
<td>5</td>
</tr>
<tr>
<td>Teaching Approach</td>
<td>5</td>
</tr>
<tr>
<td>Assessment Summary</td>
<td>6</td>
</tr>
<tr>
<td>Assessment Requirements</td>
<td>7</td>
</tr>
<tr>
<td>Assessment Policy</td>
<td>7</td>
</tr>
<tr>
<td>Assessment Tasks</td>
<td>7</td>
</tr>
<tr>
<td>Participation</td>
<td>7</td>
</tr>
<tr>
<td>Learning resources</td>
<td>8</td>
</tr>
<tr>
<td>Reading list</td>
<td>8</td>
</tr>
<tr>
<td>Feedback to you</td>
<td>9</td>
</tr>
<tr>
<td>Extensions and penalties</td>
<td>9</td>
</tr>
<tr>
<td>Returning assignments</td>
<td>9</td>
</tr>
<tr>
<td>Resubmission of assignments</td>
<td>9</td>
</tr>
<tr>
<td>Referencing requirements</td>
<td>9</td>
</tr>
<tr>
<td>Assignment submission</td>
<td>10</td>
</tr>
<tr>
<td>Online submission</td>
<td>10</td>
</tr>
<tr>
<td>Required Resources</td>
<td>10</td>
</tr>
<tr>
<td>Other Information</td>
<td>11</td>
</tr>
<tr>
<td>Policies</td>
<td>11</td>
</tr>
<tr>
<td>Faculty resources and policies</td>
<td>11</td>
</tr>
<tr>
<td>Graduate Attributes Policy</td>
<td>11</td>
</tr>
<tr>
<td>Student Charter</td>
<td>11</td>
</tr>
<tr>
<td>Student services</td>
<td>11</td>
</tr>
<tr>
<td>Monash University Library</td>
<td>12</td>
</tr>
<tr>
<td>Disability Liaison Unit</td>
<td>12</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
</tr>
</tbody>
</table>
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)

Workload Requirements

Minimum total expected workload equals 12 hours per week comprising:

(a.) Contact hours for on-campus students:

- Two hours of lectures
- One 2-hour laboratory/

(b.) Additional requirements (all students):

- A minimum of 8 hours independent study per week for completing lab and project work, private study and revision.

Additional workload requirements

Students will be expected to spend about 12 hours per week during semester on this unit as follows:

- two-hour lecture at Caulfield (as timetabled).
- two-hour lab/tutorial in at Caulfield (as timetabled) to study the background material and to work on assignments and tutorial exercises and discuss lecture material.
- up to 2 hours per week of preparation including reviewing the lecture materials
- up to 3 hours per week surveying existing literature in the library, online resources etc; hands-on lab exercises
- a minimum of 3 hours per week personal study in order to satisfy the reading and assignment expectations

While it is strongly recommended you attend lectures and lab/tutorials, lecture and other supplementary teaching material will be made available on-line and Dr. Khan can be contacted by e-mail or phone for assistance. The assignments and tutorial lab exercises can all be done at home if you have suitable facilities, but by attending lab/tutorials on campus you may get assistance from your tutor/lecturer and learn through discussion with fellow students. Lectures will be recorded but sometimes the recording technology doesn't work properly and not everything presented in lectures (such as things on overhead projectors or whiteboards) will appear on recordings.
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
Caulfield
Dr Asad Khan
Consultation hours: By arrangement via e-mail.

Tutors
Caulfield
To be announced
Consultation hours: To be announced

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 the Student Evaluation of Teaching and Units (SETU) survey. 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, see:
www.monash.edu.au/about.monash-directions/ and on student evaluations, see:
www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html
Previous Student Evaluations of this Unit

Based on previous feedback the number of assignments has been reduced from three to two, and supervised and assessed lab/tutorial sessions have been included to allow more personal guidance of students and more focused practical experience of parallel/distributed programming.

If you wish to view how previous students rated this unit, please go to https://emuapps.monash.edu.au/unitevaluations/index.jsp
Academic Overview

Learning Outcomes

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.
Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Unit Introduction on web (no lecture). Register for lab sessions</td>
<td>No formal assessment or activities are undertaken in week 0</td>
</tr>
<tr>
<td>1</td>
<td>Distributed systems</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Interprocess communication and remote procedure call</td>
<td>Weekly group submissions Week 2 to Week 10 (both Weeks inclusive)</td>
</tr>
<tr>
<td>3</td>
<td>Message Passage Library (MPI)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Synchronisation, MUTEX, Deadlocks</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Election Algorithms, Distributed Transactions, Concurrency Control</td>
<td>Assignment 1 due Monday 25 August 2014, 12PM</td>
</tr>
<tr>
<td>6</td>
<td>1) Faults, Distributed Consensus, and Security (2) Parallel Computing</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Parallel Computing Alternatives</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Instruction Level Parallelism</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Vector Architecture</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(1) Data Parallel Architectures (2) SIMD Architectures</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>(1) Introduction to MIMD (2) Distributed Memory MIMD Architectures</td>
<td>Assignment 2 code demonstrations during Week 11 labs (attendance is essential)</td>
</tr>
<tr>
<td>12</td>
<td>Class Test during lecture</td>
<td>Assignment 2 code demonstrations during Week 12 labs (attendance is essential). Class test during Week 12 lecture</td>
</tr>
<tr>
<td></td>
<td>SWOT VAC</td>
<td>No formal assessment is undertaken in SWOT VAC. Assignment 2 due Week 14, Friday 7 November 2014, 12PM</td>
</tr>
</tbody>
</table>

*Unit Schedule details will be maintained and communicated to you via your learning system.

Teaching Approach

Lecture and tutorials or problem classes

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

The lectures expound on the topics in the curriculum linking the lecturer's real-world experience with experimental and commercial systems with theoretical principles. There will be freedom to interact with the lecturer to focus on aspects of particular interest to the students or on aspects relating to assessment tasks.

The laboratory/tutorial sessions provide an environment in which students can explore aspects of the
curriculum through practical exercises, learning through experience. Having the academic staff member present enables assistance and explanation of unexpected behaviour. The laboratory/tutorial sessions also provide a forum where students can compare experiences and help one another to reach an understanding of the material, and where the tutor can elaborate on material covered in lectures.

**Assessment Summary**

In-semester assessment: 100%

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Value</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1 - Distributed Systems</td>
<td>25%</td>
<td>Week 5, Monday 25 August 2014, 12PM</td>
</tr>
<tr>
<td>Assignment 2 - Parallel Computing</td>
<td>25% (6% for code demonstration)</td>
<td>Code demonstrations during Week 11 or 12 labs. Assignment due Week 14, Friday 7 November 2014, 12PM</td>
</tr>
<tr>
<td>Class Test - Parallel Architectures</td>
<td>25%</td>
<td>During the Week 12 lecture</td>
</tr>
<tr>
<td>The assessed laboratory/tutorial work</td>
<td>25%</td>
<td>Weekly group submissions Week 2 to Week 10 (both Weeks inclusive)</td>
</tr>
</tbody>
</table>
Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles

Academic Integrity - Please see resources and tutorials at
http://www.monash.edu/library/skills/resources/tutorials/academic-integrity/

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 distributed systems topics.

  The detailed assignment specification and topics will be provided on the unit web site.

  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: Week 5, Monday 25 August 2014, 12PM

• Assessment task 2

  Title: Assignment 2 - Parallel Computing

  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% (6% for code demonstration)

  Criteria for assessment: Individual assessment. This work will be assessed on a mix of programming tasks and theoretical write-up.

  Due date: Code demonstrations during Week 11 or 12 labs. Assignment due Week 14, Friday 7 November 2014, 12PM
Assessment Requirements

• Assessment task 3
  
  Title:  
  Class Test - Parallel Architectures
  
  Description:  
  Students will be given a 60 minutes class test during the Week 12 lecture, based on the parallel architecture lecture notes, comprising several short questions.
  
  Weighting:  
  25%
  
  Criteria for assessment:  
  Individual assessment. Correct answers to questions.
  
  Due date:  
  During the Week 12 lecture
  
  Remarks:  
  The test will be closed book. No calculators or computers will be required.

• Assessment task 4
  
  Title:  
  The assessed laboratory/tutorial work
  
  Description:  
  Assessed laboratory/tutorial work submissions. The code developed during the lab will be demonstrated and the results submitted at the end of each laboratory/tutorial session.
  
  Weighting:  
  25%
  
  Criteria for assessment:  
  The laboratory work is group-based and it is assessed on correctness and on the quality of the solutions and on the quality of presentation/documentation. Individual marks for each group member will be derived from (i) the peer assessments made by the group under the supervision of the tutor and (ii) the overall marks achieved by the group.
  
  Due date:  
  Weekly group submissions Week 2 to Week 10 (both Weeks inclusive)

Learning resources

Reading list

The following are some books that may be of interest. There is no single text book covering the content of FIT5174 at a suitable level. Sufficient material will be provided on the unit web site to cater for FIT5174 students. If students have interests in specific areas of parallel or distributed computing they should contact the lecturer for advice on suitable references.


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


Further resources will be made available via the unit website.

Monash Library Unit Reading List (if applicable to the unit)
http://readinglists.lib.monash.edu/index.html

Faculty of Information Technology Style Guide

Feedback to you

Examination/other end-of-semester assessment feedback may take the form of feedback classes, provision of sample answers or other group feedback after official results have been published. Please check with your lecturer on the feedback provided and take advantage of this prior to requesting individual consultations with staff. If your unit has an examination, you may request to view your examination script booklet, see http://intranet.monash.edu.au/infotech/resources/students/procedures/request-to-view-exam-scripts.html

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

- Informal feedback on progress in labs/tutes
- Graded assignments with comments
- Test results and feedback

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.monash.edu.au/exams/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

Resubmission of assignments after the due date will not be allowed, however assignments handed-in early for feedback may be resubmitted by the due date.

Referencing requirements

Formatting and referencing information will provided on the unit website.
Assignment submission

It is a University requirement 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). Please note that it is your responsibility to retain copies of your assessments.

Online submission

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

Required Resources

Please check with your lecturer before purchasing any Required Resources. Limited copies of prescribed texts are available for you to borrow in the library, and prescribed software is available in student labs.

VMPlayer (Freeware) or VMWare Workstation (VMWare Fusion for Mac users) software. This is available in University computer labs, but access to a personal computer with this software installed is highly recommended.
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:

Key educational policies include:

- Student Academic Integrity Policy and Student Academic Integrity: Managing Plagiarism and Collusion Procedures;
  http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-policy.html
- Assessment in Coursework Programs;
- Special Consideration;
  http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.html
- 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/dates/
- Orientation and Transition;
  http://intranet.monash.edu.au/infotech/resources/students/orientation/
- Academic and Administrative Complaints and Grievances Policy;
  http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.html

Faculty resources and policies

Important student resources including Faculty policies are located at
http://intranet.monash.edu.au/infotech/resources/students/

Graduate Attributes Policy

http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.html

Student Charter


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 http://www.monash.edu.au/students. For Malaysia see http://www.monash.edu.my/Student-services, and for South Africa see http://www.monash.ac.za/current/.
Monash University Library

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

Disability Liaison Unit

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://www.monash.edu/equity-diversity/disability/index.html
- Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Community Services at 03 55146018 at Malaysia
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus

Other

Reading material including research papers, programming manuals and system specifications, will be distributed electronically as part of the background reading material for FIT5174.

Feel free to e-mail the lecturer, Dr. Asad Khan, with any queries. Please include "FIT5174" in the subject line to ensure prompt responses. Dr. Khan's e-mail address is:

Asad.Khan@monash.edu