MONASH University
Information Technology

FIT3143
Parallel computing

Unit Guide

Semester 1, 2015

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: 19 Feb 2015

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FIT3143 Parallel computing - Semester 1, 2015

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. The unit examines both shared memory and message passing paradigms in both hardware and software; concurrency, multithreading and synchronicity; parallel, clustered and distributed supercomputing models, languages and software tools and development environments. Students will program in these paradigms.

Mode of Delivery

Clayton (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
- One 1-hour tutorial

(b.) Additional requirements (all students):

- A minimum of 7 hours independent study per week for completing lab and assignment work, private study and revision.

See also Unit timetable information

Unit Relationships

Prohibitions

FIT4001, CSE4333

Prerequisites

FIT2004

Chief Examiner

Dr Asad Khan

Campus Lecturer

Clayton

Asad I. Khan

Consultation hours: By appointment via e-mail: Asad.Khan@monash.edu

Tutors

Clayton

Asad I. Khan

Consultation hours: By appointment via e-mail: Asad.Khan@monash.edu

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

Previous student feedback shows that most students, typically 50 percent or more, rated this unit very highly. There are no significant changes planned based on feedback results.

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

On successful completion of this unit, students should be able to:

- explain and analyse parallel computing models;
- explain and analyse IPC schemes in parallel systems;
- explain and analyse concurrency schemes in parallel;
- explain and analyse parallel/vector/GPU architectures;
- program socket and MPI applications.

Unit Schedule

Week	Activities	Assessment
0	Unit Introduction on Moodle	No formal assessment or activities are undertaken in week 0
1	Unit Introduction; Distributed Systems Lecture	No lab and tutorial in week 1
2	Inter Process Communications; Remote Procedure Calls	Assessed lab and tutorial work begins in week 2
3	Message Passing Library	
4	Synchronisation, MUTEX, Deadlocks	
5	Election Algorithms, Distributed Transactions, Concurrency Control	Assignment 1 due Mon 30-March-2015, 2PM
6	Faults, Distributed Consensus, Security, Parallel Computing	
7	Parallel Computing Alternatives	
8	Instruction Level Parallelism	
9	Vector Architecture	
10	Data Parallel Architectures, SIMD Architectures	
11	Introduction to MIMD, Distributed Memory MIMD Architectures	Assignment 2 due Mon 18-May-2015, 2PM. In-lab demonstrations of Assignment 2.
12	Super Scalar Processing, Exam Revision	In-lab demonstrations of Assignment 2.
	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 learning system.

Teaching Approach

Lecture and tutorials or problem classes

An integrated approach to teaching and learning enables material provided in lectures to be influenced by the performance of students in tutorials and laboratory sessions.

Assessment Summary

Examination (3 hours): 50%; In-semester assessment: 50%

Assessment Task	Value	Due Date
Assignment 1	15%	Mon 30-March-2015, 2PM
Assignment 2	25%	In-lab assessments week 11 and 12, Theory due Mon 18-May-2015, 2PM

Unit Schedule

Tutorial and Laboratory work assessments	10%	Tutorial and laboratory work will be scheduled throughout the semester with weekly submissions.
Examination 1	50%	To be advised

Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles
(http://intranet.monash.edu.au/infotech/resources/staff/edgov/policies/assessment-examinations/assessment-hurd

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

Assessment Tasks

Participation

It is highly recommended that you attend all lectures.

Attendance at tutorials and laboratory sessions is required. Work in these sessions will contribute to the final unit asssessment.

- **Assessment task 1**

    Title:
    Assignment 1
    Description:
    Individual assignment. A research paper of about 3000 words. Details of topics and submission procedures will be provided.
    Weighting:
    15%
    Criteria for assessment:
    The work will be assessed on the basis of the quality of the write-up (e.g. easy to read, logical and systematic presentation of concepts, formatting, figures, tables), relevance and accuracy of information, and literature search.
    Due date:
    Mon 30-March-2015, 2PM

- **Assessment task 2**

    Title:
    Assignment 2
    Description:
    Individual assignment. The work will comprise two parallel distributed programming tasks and a 1500-word write-up. The coding part will be assessed in the lab class, with each student demonstrating the written program/s to the tutor in week 11 and week 12. The write-up will be submitted in week 11.
    Weighting:
    25%
    Criteria for assessment:

    Detailed marking guide will be provided with the assessment. As a general guide to assessing the coding work:

    1. All programs must compile and run correctly.

2. Programs must meet the problem specification.
3. Source code should be readable and maintainable.
4. The underlying algorithms are clearly explained.
5. Programs should be documented.

Due date:
In-lab assessments week 11 and 12, Theory due Mon 18-May-2015, 2PM

- **Assessment task 3**

Title:
Tutorial and Laboratory work assessments
Description:
There are weekly scheduled tutorial and laboratory sessions. Any programming work will have to be properly documented explaining its resource requirements and expected performance characteristics and will have to be demonstrated to work during laboratory sessions.

Students will complete the weekly lab and tutorial exercises in groups of 4-5 and submit their group work on weekly basis.
Weighting:
10%
Criteria for assessment:

The assessment will be based on the demonstration of work during the lab and evidence of learning in the weekly submissions.

The tutor will monitor individual contributions to the group when allocating marks to members of the group.
Due date:
Tutorial and laboratory work will be scheduled throughout the semester with weekly submissions.

Examinations

- **Examination 1**

Weighting:
50%
Length:
3 hours
Type (open/closed book):
Closed book
Electronic devices allowed in the exam:
None

Learning resources

Reading list

Students are strongly advised to attend the lectures. Although the lectures will be recorded, the technology is not perfect and should not be relied upon. Sufficient material will be presented during the lectures and tutorials to enable the examination to be passed, but further reading is

advisable. It is not necessary to purchase any books, but the following reading list may be of some use, especially if you have not studied computer architecture. Other recommended reading will be included via links in Moodle.

For Parallel Computing Schemes and Software:

A.S. Tanenbaum, T. Austin: Structured Computer Organization, 6th Edition, Prentice Hall (PEARSON), 2012.

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.

For Parallel Distributed Computing Architectures:

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

W. Stallings: Computer Organization Architecture, 9th Edition, Prentice Hall (Pearson Hall), 2013.

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

Feedback to you

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

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

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.

Referencing requirements

Details provided on Moodle.

Assignment submission

It is a University requirement
(http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-managing-pla
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 electronic submission). 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.

The standard operating environment provided in FIT computer labs is considered adequate for most
purposes. However, most of the tutorial exercises require the use of an open source Linux environment,
which is provided in the assigned FIT computer laboratory.

Software may be:

- downloaded (details provided on Moodle)
- or purchased at academic price at good software retailers

Recommended Resources

Portable personal computer and access to a broadband Internet connection. Lab computers are also
available to use during timetabled hours.

Examination material or equipment

Advice about the final examination will be provided.

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:
www.policy.monash.edu.au/policy-bank/academic/education/index.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.h

Student Charter

www.opq.monash.edu.au/ep/student-charter/monash-university-student-charter.html

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 Commuity 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