MONASH University
Information Technology

Unit Guide

FIT3143
Parallel computing

Semester 2, 2018

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: 18 Jul 2018

Status: Approved

Table of contents

FIT3143 Parallel computing - Semester 2 (S2-01) - 2018

Unit handbook information

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. The unit examines shared memory and message passing paradigms in 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 (On-campus)
Malaysia (On-campus)

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 2-3 hours of personal study per one hour of lecture time in order to satisfy the reading, tute, prac and assignment expectations.

See also Unit timetable information

Unit relationships

Prerequisites

FIT2004

Prohibitions

FIT4001, CSE4333

Co-requisites

None

Chief Examiner

[Dr Asad Khan](#)

Campus Lecturer(s)

Clayton

Name: Dr Asad Khan
Email: Asad.Khan@monash.edu
Consultation hours: By appointment via e-mail: fit3143help@gmail.com

Malaysia

Name: Dr Vishnu Monn
Email: Vishnu.Monn@monash.edu

Academic overview

Learning outcomes

At the completion of this unit, students should be able to:

1. explain and analyse parallel computing models;
2. explain and analyse IPC schemes in parallel systems;
3. explain and analyse concurrency schemes in parallel;
4. explain and analyse parallel / vector / GPU architectures;
5. program socket and MPI applications.

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 (2 hours): 50%; In-semester assessment: 50%

Assessment task	Value	Due date
Assignment 1	15%	Mon 27-Aug-2018, 2PM
Assignment 2	25%	In-lab assessments week 11 and 12, Theory due Mon 08-Oct-2018, 2PM

Assessment task	Value	Due date
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

Unit schedule

For units with on-campus classes, teaching activities are normally scheduled to start on the hour (teaching will commence on the hour and conclude 10 minutes prior to the scheduled end time).

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	
6	Faults, Distributed Consensus, Security, Parallel Computing	Assignment 1 due Mon 27-Aug-2018, 2PM
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 08-Oct-2018, 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.

Assessment requirements

Faculty Unit Assessment Pass Policy

To pass a unit which includes an examination as part of the assessment, a student must obtain, unless otherwise approved and published:

- 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.

For units with 100% in-semester assessment, there is a 40% pass rate required for each major assessment item (i.e. items worth 20% or more) in order to pass the unit.

If a student does not achieve 40% or more in the unit examination or the unit non-examination total assessment, or 40% or more for each major assessment item where there is 100% in-semester assessment, and the total mark for the unit is:

- equal to or greater than 50%, then a mark of 49-N will be recorded for the unit.
- less than 50% then the actual mark for the unit will be recorded.

Participation

It is highly recommended that you attend all lectures.

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

Assessment tasks

Assessment title: Assignment 1

Learning outcomes: LO1,2,3

Details of task: Individual assignment. A research paper of about 3000 words. A list of topics and submission procedures will be provided.

Value: 15%

Hurdle requirements: N/A

Individual assessment in group tasks: N/A

Criteria for marking: 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 27-Aug-2018, 2PM

Estimated return date: 10-Sep-2018

Additional information:

Late penalty of 5% per day after the due date, including the weekends.

Assessment title: Assignment 2

Learning outcomes: LO 4,5

Details of task: 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.

Value: 25%

Hurdle requirements: N/A

Individual assessment in group tasks: N/A

Criteria for marking: 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 08-Oct-2018, 2PM

Estimated return date: 22-Oct-2018

Additional information: Late penalty of 5% per day after the due date, including the weekends.

Assessment title: Tutorial and Laboratory work assessments

Learning outcomes: LO 2,3,5

Details of task: 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.

Value: 10%

Hurdle requirements: N/A

Individual assessment in group tasks: Each team member will generally receive the same mark as the group unless a member is reported by the group through peer assessment.

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

Due date: Tutorial and laboratory work will be scheduled throughout the semester with weekly submissions.

Estimated return date: On weekly basis

Additional information: All lab work must be submitted, as instructed by the tutor, every week (from week 2-10 both weeks inclusive). Late submissions may not be marked.

Examination(s)

Title : Examination 1
Value : 50%
Length : 2 hours
Type (open/closed book) : Closed book
Electronic devices allowed : None
Learning outcomes assessed : LO 1-4

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 lecturer via the in-semester special consideration process: http://www.monash.edu.au/exams/special-consideration.html

Late penalty of 5% per day after the due date, including the weekends.

Returning assignments

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

Referencing requirements

To build your skills in citing and referencing, and using different referencing styles, see the online tutorial Academic Integrity: Demystifying Citing and Referencing at
http://www.lib.monash.edu/tutorials/citing/

Assignment submission

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

Please note:

1. It is your responsibility to retain copies of your assessments.
2. Assessments submitted without an assignment coversheet will not be marked.

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.

All assignments must be submitted through Moodle.

Please keep a copy of tasks completed for your records.

Feedback to you

Informal feedback on progress in labs/tutes
Graded assignments with comments
Examination feedback after results publication

Learning resources

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://monash.rl.talis.com/index.html
Research and Learning Online: www.monash.edu/rlo

Required resources

Students generally must be able to complete the requirements of their course without the imposition of fees that are additional to the student contribution amount or tuition fees. However, students may be charged certain incidental fees or be expected to make certain purchases to support their study. For more information about this, refer to the Higher Education Administrative Information for Providers, Chapter 18, Incidental Fees at http://education.gov.au/help-resources-providers.

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.

Additional information:
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

Technological requirements

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

(For Clayton Campus ONLY) *Please note:* This is a bring your own device unit. You will be expected to bring a web-connected device (i.e., laptop or tablet) to class to access specialist software. The applications for your class can be accessed at the website move.monash.edu. For more information, visit monash.edu/mov

Examination material or equipment

Advice about the final examination will be provided.

Your feedback to us

One of the formal ways students have to provide feedback on teaching and their learning experience is through the Student Evaluation of Teaching and Units (SETU) survey. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied with and areas for improvement.

Previous student evaluations of this unit
In response to previous SETU results of this unit, the following changes have been made:

- Previous student feedback showed the students had some difficulty with understanding instructions for the assessment tasks. The instructions have been revised with changes to the wordings and the explanatory figure.

If you wish to view how previous students rated this unit, please go to:
https://www.monash.edu/ups/setu/about/setu-results/unit-evaluation-reports

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

Student Academic Integrity Policy

www.monash.edu/__data/assets/pdf_file/0004/801841/Student-Academic-Integrity-Policy.pdf

Special Consideration

For information on applying for special consideration, please visit: http://www.monash.edu/exams/changes/special-consideration

Graduate Attributes Policy

http://www.monash.edu/__data/assets/pdf_file/0009/786969/Course-Design-Policy.pdf

Student Charter

http://www.monash.edu/students/policies/student-charter.html

Student Services

The University provides many different kinds of services to help you gain the most from your studies. Contact your tutor if you need advice and see the range of services available at http://www.monash.edu/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 http://www.monash.edu/library 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 Support Services

Students who have a disability, ongoing medical or mental health condition are welcome to contact Disability Support Services.

Disability Support Services also support students who are carers of a person who is aged and frail or has a disability, medical condition or mental health condition.

Disability Advisers visit all Victorian campuses on a regular basis.

- Website: monash.edu/disability
- Telephone: 03 9905 5704 to book an appointment with an Adviser, or contact the Student Advisor, Student Community Services at 03 55146018 at Malaysia
- Email: disabilitysupportservices@monash.edu
- Drop In: Level 1, Western Annexe, 21 Chancellors Walk (Campus Centre) Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus