MONASH University
Information Technology

FIT3143
Parallel computing

Unit Guide

Semester 1, 2014

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FIT3143 Parallel computing - Semester 1, 2014

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.

Unit Relationships

Prohibitions

FIT4001, CSE4333

Prerequisites

FIT2004

Chief Examiner

Dr Carlo Kopp

Campus Lecturer

Clayton

Dr. Ronald Pose

Consultation hours: By appointment via e-mail: Ronald.Pose@monash.edu

Tutors

Clayton

Dr. Ronald Pose

Consultation hours: By appointment via e-mail: Ronald.Pose@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

At the completion of this unit students will have -A knowledge and understanding of:

- a variety of parallel architectures, such as bus-based, massively parallel, cluster, vector, GPU;
- a variety of parallel programming paradigms, synchronisation and parallelisation primitives, message passing, data parallel, tuple space;
- concurrency, synchronicity and parallelism;
- software development environments and tools (including performance tools);
- the design issues of parallel systems.

An appreciation of:

- the needs of parallel applications.

Developed skills in:

- designing, developing and debugging parallel programs using a variety of paradigms;
- measuring the performance of parallel applications and tuning implementation.

Unit Schedule

Week	Activities	Assessment
0	Unit Introduction on Moodle	Please prepare a short summary of your programming experience, knowledge of computer architecture, and knowledge of parallel computing for Week 1 tutorials and laboratory sessions. Be honest since this information will be used to determine background material to be taught or provided to help you deal with FIT3143.
1	Unit Introduction; Distributed Systems Lecture (tutorials and laboratory sessions begin in week 1)	While no formal assessment will take place in week 1, the week 1 tutorials and laboratory sessions will be used to assess the skills and knowledge of the students and to explain the tools to be used in FIT3143
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 7-April-2014, 12PM (mid-day)
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 19-May-2014, 12PM (mid-day).
12	Super Scalar Processing, GPU Processing, Exam Revision	
	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

Unit Schedule

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 7-April-2014, 12PM
Assignment 2	25%	Mon 19-May-2014, 12PM
Tutorial and Laboratory work assessments	10%	Tutorial and laboratory work will be scheduled throughout the semester.
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 7-April-2014, 12PM

- **Assessment task 2**

  Title:
  Assignment 2
  Description:
  Individual assignment. This will be a more substantial research report of about 5000 words on how many of the parallel computer architectural features and parallel software systems appear in modern computer systems in everyday use. Details will be provided.
  Weighting:
  25%
  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 19-May-2014, 12PM

- **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.
Weighting:
10%
Criteria for assessment:
The assessment will be based on the quality and 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.

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

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

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 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.

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.

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

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.h
- Assessment in Coursework Programs; http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-po
- Special Consideration; http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.ht
- 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.h

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.ht

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