School of Information and Physical Sciences

COMP2240: Operating Systems
Callaghan
Semester 2 - 2023

OVERVIEW

Course Description   Students are introduced to modern operating systems, the most prominent system software, focusing on their purposes, principles and functionalities. The course will explore different components of operating systems and the services offered by them to increase the productivity, efficiency and convenience of users. Topics include processes and threads, process synchronisation, starvation and deadlocks, resource scheduling, physical and virtual memory organisation and their management, file systems, disk management and scheduling, and security issues. Real operating systems are used for case study where appropriate.

Assumed Knowledge   SENG1120
Contact Hours   **Callaghan**
Lecture
Face to Face On Campus
2 hour(s) per Week for Full Term

Tutorial
Face to Face On Campus
2 hour(s) per Week for 12 Weeks starting Week 1
Starts in Week 1 and then Weeks 3-13

Unit Weighting   10
Workload   Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator	**Callaghan** Dr Nasimul Noman Nasimul.Noman@newcastle.edu.au (02) 4042 0488 Consultation: Tuesday 12:00~14:00 (preferably via prior appointment)
Teaching Staff	Dr Nasimul Noman Phone: (02) 4042 0488 Email: Nasimul.Noman@newcastle.edu.au Office: ES237 Mr. Daniel Bell Email: daniel.p.bell@newcastle.edu.au
School Office	**School of Information and Physical Sciences** SR233, Social Sciences Building Callaghan CESE-SIPS-Admin@newcastle.edu.au +61 2 4921 5513 9am-5pm (Mon-Fri)

SYLLABUS

Course Content	1. Hardware overview. 2. Processes and process scheduling including multi-processors. 3. Concurrency control using hardware and software techniques. 4. Memory Management. 5. Virtual memory. 6. I/O and disk management. 7. File systems and file manipulation. 8. Security mechanisms.

Course Learning Outcomes	**On successful completion of this course, students will be able to:** 1. Discover the structure, functions and components of modern operating systems. 2. Connect how OS abstractions are realised on conventional hardware. 3. Examine the central issues and methods/algorithms employed in operating systems design. 4. Develop essential skills of programming with consideration of concurrency and multithreads. 5. Gain familiarity with some popular operating systems and identify their functional features.

Course Materials	**Lecture Materials:** - Students enrolled in this course can login at https://canvas.newcastle.edu.au/ to access the Canvas site used to support this course. You need to visit the Canvas site on a regular basis (multiple times per week) for up to date lecture materials. **Multi-Media Resource:** - Every week a couple of videos on core concepts will be released in the Canvas. Students are expected to watch those videos before they attend the weekly lecture. The basic

ideas learnt from these videos will enable students to have a better engagement in the lectures and tutorials.

Recommended Reading:
- A selection of publicly available lecture notes and other types of material may be added to the list of learning materials and texts if required. The information regarding such materials will be announced in Canvas.

Required Text:
- Operating Systems: Internals and Design Principles (9th Edition), Global Edition by William Stallings, Pearson Education, 2017. ISBN: 9781292214290.
OR
Operating Systems: Internals and Design Principles (8th Edition), Global Edition by William Stallings, Pearson Education, 2014. ISBN-10: 1292061359, ISBN-13: 978-1292061351.

COMPULSORY REQUIREMENTS

In order to pass this course, each student must complete ALL of the following compulsory requirements:

Contact Hour Requirements:
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Course Assessment Requirements:
- Assessment 4 - Formal Examination: Minimum Grade / Mark Requirement - Students must obtain a specified minimum grade / mark in this assessment item to pass the course. Students whose overall mark in the course is 50% or more, but who score less than 40% in the compulsory item and thus fail to demonstrate the required proficiency, will be awarded a Criterion Fail grade, which will show as FF on their formal transcript. However, students in this position who have scored at least 25% in the compulsory item will be allowed to undertake a supplementary 'capped' assessment in which they can score at most 50% of the possible mark for that item.

Pre-Placement Requirements:
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SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	17 Jul	Operating System Overview		
2	24 Jul	Processes and Threads		
3	31 Jul	Scheduling		Release of Assignment 1
4	7 Aug	Real-time System Scheduling and Multiprocessor Scheduling		
5	14 Aug	Concurrency: Mutual Exclusion and Synchronisation		
6	21 Aug	Concurrency: Deadlock and Starvation		Assignment 1 Due 25/08 (Friday), Release of Assignment 2
7	28 Aug	Memory Management I		
8	4 Sep	Midterm Exam, Concurrency & MM		Midterm Exam 06/09 (Wednesday)
9	11 Sep	Memory Management II		Assignment 2 Due 15/09 (Friday), Assignment 3 Out
10	18 Sep	Disk and I/O Scheduling		
Mid Term Break				
Mid Term Break				
11	9 Oct	File Management		
12	16 Oct	Security and Protection		Assignment 3 Due 20/10 (Friday)
13	23 Oct	Course Review		
Examination Period				
Examination Period				

ASSESSMENTS

This course has 5 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Programming Assignment 1	Week 6 (25/08/2023 23:59)	Individual	10%	1
2	Programming Assignment 2	Week 9 (15/09/2023 23:59)	Individual	15%	2, 3, 4
3	Programming Assignment 3	Week 12 (20/10/2023 23:59)	Individual	15%	1, 2
4	Final Examination*	Exam Period	Individual	45%	1, 2, 3, 4, 5
5	Midterm Test	Week 8 (06/09/2023 during lecture)	Individual	15%	1, 3, 5

* This assessment has a compulsory requirement.

Late Submissions	The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Programming Assignment 1

Assessment Type	Written Assignment
Purpose	This programming assignment meets the course objectives of knowledge acquisition and design of solutions by requiring the development of programs that demonstrate understanding of the topics and concepts in operating systems.
Description	In this programming assignment students will be required to implement scheduling algorithms and compare their performance. In this assessment emphasis will be given in providing correctness of programs following the algorithmic procedures which were delivered in lectures and are in the textbook.
Weighting	10%
Length	Students will have around 2 weeks to complete this
Due Date	Week 6 (25/08/2023 23:59)
Submission Method	Online
Assessment Criteria	Detailed assessment criteria for each assessment task and any other additional material will be available on the course Canvas site no less than two weeks prior to the due date of each assessment.
Return Method	Online
Feedback Provided	Online - .

Assessment 2 - Programming Assignment 2

Assessment Type	Written Assignment
Purpose	This programming assignment meets the course objectives of knowledge acquisition and design of solutions by requiring the development of programs that demonstrate understanding of the topics and concepts in operating systems.
Description	In this programming assignment students will be required to implement solutions for handling concurrency, race condition and deadlock by using semaphores and monitors. In this assessment emphasis will be given in providing correctness of programs following the algorithmic procedures which were delivered in lectures and are in the textbook.
Weighting	15%
Length	Students will have around 2 weeks to complete this
Due Date	Week 9 (15/09/2023 23:59)
Submission Method	Online
Assessment Criteria	Detailed assessment criteria for each assessment task and any other additional material will be available on the course Canvas site no less than two weeks prior to the due date of each assessment.
Return Method	Online
Feedback Provided	Online - .

Assessment 3 - Programming Assignment 3

Assessment Type	Written Assignment
Purpose	This programming assignment meets the course objectives of knowledge acquisition and design of solutions by requiring the development of programs that demonstrate understanding of the topics and concepts in operating systems.
Description	In this programming assignment students will be required to implement memory management algorithms / disk scheduling algorithms / file management technique and compare their performance. In this assessment emphasis will be given in providing correctness of programs following the algorithmic procedures which were delivered in lectures and are in the textbook.
Weighting	15%
Length	Students will have around 2 weeks to complete this
Due Date	Week 12 (20/10/2023 23:59)
Submission Method	Online
Assessment Criteria	Detailed assessment criteria for each assessment task and any other additional material will be available on the course Canvas site no less than two weeks prior to the due date of each assessment.
Return Method	Online
Feedback Provided	Online - .

Assessment 4 - Final Examination

Assessment Type	Formal Examination
Purpose	The final formal exam is designed to test the individual student's knowledge of the course material and their ability to describe, analyse and hypothesize from this material.
Description	
Weighting	45%
Compulsory Requirements	Minimum Grade / Mark Requirement - Students must obtain a specified minimum grade / mark in this assessment item to pass the course..
Due Date	Exam Period
Submission Method	Formal Exam
	Materials permitted in the Formal Exam:
	1. A4 double sided sheet of handwritten or typed notes (Memory Aid sheet)
	2. Any non-programmable calculators are permitted
Assessment Criteria	
Return Method	Not Returned
Feedback Provided	No Feedback - .
Opportunity to Reattempt	Students WILL be given the opportunity to reattempt this assessment. Refer to course outline for details.

Assessment 5 - Midterm Test

Assessment Type	In Term Test
Purpose	The purpose and benefit of the mid-term exam is to provide students a feedback on the status of their learning in this course. Based on the assessed progress, students would be able to aware about the strength and weakness of their learning in this course.
Description	This test highlights the areas of concern and may stimulate discussion with tutors and lecturers. Mid-term exam is not the only one way of doing this and students should actively participate in tutorials and engage in lecture discussions during the whole term.
Weighting	15%
Due Date	Week 8 (06/09/2023 during lecture)
Submission Method	Specific Location
	Format and schedule of the midterm test will be announced in the Canvas.
Assessment Criteria	
Return Method	In Class
Feedback Provided	Returned Work - .

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of	Grade	Description

Marks		
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:
- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.
As a result of student feedback, the following changes have been made to this offering of the course:
- No major change in the course requested in the feedback of the previous delivery. Minor adjustments and updates in the lectures for improving the delivery.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure. In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule.

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35.

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s).
Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:
1.   the assessment item is a major assessment item; or
2.   the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3.   you are requesting a change of placement; or
4.   the course has a compulsory attendance requirement.
Before applying you must refer to the Adverse Circumstance Affecting Assessment Items

Procedure available at:
https://policies.newcastle.edu.au/document/view-current.php?id=236

Important Policy Information
The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures   at https://www.newcastle.edu.au/current-students/no-room-for/policies-and-procedures that support a safe and respectful environment at the University.

Other Information
1. The course is delivered in a semi-flip mode. Every week a couple of videos on core concepts will be released in the Canvas. Students are expected to watch those videos before they attend the lectures. The lectures are delivered with the assumption that students are familiar with those concepts in the video. The basic ideas learnt from these videos will enable students to have a better engagement in the lectures and tutorials.

2. Students are strongly advised to attend lectures and tutorials in order to gain a full understanding of the theoretical and practical skills required in this discipline.

3. The teaching schedule is subject to change. Changes will be posted on Canvas.

4. Detailed assessment criteria for each assessment task and any additional material will be available on the course Canvas site no less than two weeks prior to the due date of each assessment.

5. The assignments and midterm will be returned but it is strongly recommended that students should keep a copy of any material submitted.

6. The marks will be available in Canvas. If you have any questions about the marking, discuss it with your demonstrator and if necessary with the course coordinator.

GRADUATE PROFILE STATEMENTS

The following table illustrates how this course contributes towards building the skills students will need to work in their profession.
- Level of capability
- Level 1 indicates an introduction to a topic at a university level
- Levels 2 and 3 indicate progressive reinforcement of that topic
- Level 4 indicates skills commensurate with a graduate – entry to professional practice
- Level 5 indicates highly specialist or professional ability

	University of Newcastle Bachelor of Computer Science Graduate Profile Statement	Taught	Practised	Assessed	Level of capability
1	Knowledge of basic science and computer science fundamentals				
2	In depth technical competence in the discipline of computer science	X	X	X	2
3	An ability to carry out problem analysis, requirements capture, problem formulation and integrated software development for the solution of a problem				
4	Capacity to continue developing relevant knowledge, skills and expertise in computer science throughout their careers				
5	An ability to communicate effectively with other Computer Scientists, Software Engineers, other professional disciplines, managers and the community generally	X	X	X	2
6	Ability to undertake and co-ordinate large computer science projects and to identify problems, their formulation and solution				
7	Ability to function effectively as an individual, a team member in multidisciplinary and multicultural teams and as leader/manager with capacity to assist and encourage those under their direction				
8	Understanding of social, cultural, global and business opportunities of the professional computer scientist; understanding the need for and principles of sustainability and adaptability				
9	Understanding of professional and ethical responsibilities and a commitment to them				
10	Understanding of entrepreneurship; need of and process of innovation, as well as the need of and capacity for lifelong learning				

	University of Newcastle Bachelor of Engineering Graduate Profile Statements	Taught	Practised	Assessed	Level of capability
	Knowledge Base				
1	1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.				
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.				
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	X	X	X	2
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.				
5	1.5. Knowledge of contextual factors impacting the engineering discipline.				
6	1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.				
	Engineering Ability				
7	2.1. Application of established engineering methods to complex engineering problem solving.				
8	2.2. Fluent application of engineering techniques, tools and resources.				
9	2.3. Application of systematic engineering synthesis and design processes.				
10	2.4. Application of systematic approaches to the conduct and management of engineering projects.				
	Professional Attributes				
11	3.1. Ethical conduct and professional accountability				
12	3.2. Effective oral and written communication in professional and lay domains.	X	X	X	2
13	3.3. Creative, innovative and pro-active demeanour.				
14	3.4. Professional use and management of information.				
15	3.5. Orderly management of self, and professional conduct.				
16	3.6. Effective team membership and team leadership.				