Faculty of Engineering & Built Environment

School of Electrical Engineering and Computing

COMP2240: Operating Systems

Callaghan

Semester 2 - 2019

COURSE OUTLINE

OVERVIEW

Course Description

Introduces computer operating system principles, using practical examples. Topics include tasking and processes, process coordination and synchronisation, resource scheduling, physical and virtual memory organisation, security issues, communications and networking, and distributed operating systems. The Unix operating system is used as a 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 Full Term starting Week 2

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 Nan Li
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02 49 216503
Consultation: Monday: 15:00-17:00
Friday: 12:30-14:30

Teaching Staff

TBA

School Office

School of Electrical Engineering and Computing
ICT307
ICT Building
Callaghan
+61 2 4921 5330
9.00am-1.00pm and 2.00pm-5.00pm (Monday to Friday)

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.
9. Networking.
10. Process migration

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Develop an understanding of the structure and function of operating systems, including the kernel, process scheduling, memory management, input/output device management, file systems, interprocess communication, networks and distributed systems, protection, security and recovery

2. Develop an understanding of how OS abstractions are realized on conventional hardware

3. Gain familiarity with various design issues in operating systems and the corresponding primitive methods and algorithms dealing with these issues.

4. Develop essential programming skills of programming with consideration of concurrency and multithreads etc

5. Gain familiarity with some real operating systems.

Course Materials

Lecture Materials:

- Students enrolled in this course can login at http://uonline.newcastle.edu.au to access the Blackboard site used to suppot this course. You need to visit the Blackboard site on a regular basis for up to date lecture materials.

Multi-Media Resource:

- Every week a couple of videos on core concepts will be released in the blackboard. 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 Blackboard.

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	29 Jul	Operating System Overview		
2	5 Aug	Processes and Threads		
3	12 Aug	Scheduling		Assignment 1 Out
4	19 Aug	Real-time System Scheduling and Multiprocessor Scheduling		
5	26 Aug	Concurrency: Mutual Exclusion and Synchornisation		
6	2 Sep	Concurrency: Deadlock and Starvation		Assignment 1 Due Assignment 2 Out
7	9 Sep	Memory Management I		
8	16 Sep	Memory Management II		Midterm Exam
9	23 Sep	Disk and I/O Scheduling		Assignment 2 Due Assignment 3 Out
Mid Semester Break				
Mid Semester Break				
10	14 Oct	File Management		
11	21 Oct	Security and Protetion		
12	28 Oct	Course Review		Assignment 3 Due
13	4 Nov			
Exam Period				
Exam Period				
Exam 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.	Individual	10%	1
2	Programming Assignment 2	Week 9.	Individual	15%	2, 3
3	Programming Assignment 3	Week 12.	Individual	15%	1
4	Final Examination*	Exam Period.	Individual	45%	1, 2, 3, 4, 5
5	Midterm test	Week 8	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.
Submission Method Online
Assessment Criteria Detailed assessment criteria for each assessment task and any other additional material will be available on the course Blackboard 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.
Submission Method Online
Assessment Criteria Detailed assessment criteria for each assessment task and any other additional material will be available on the course Blackboard 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 and disk 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	15%
Length	Students will have around 3 weeks to complete this
Due Date	Week 12.
Submission Method	Online
Assessment Criteria	Detailed assessment criteria for each assessment task and any other additional material will be available on the course Blackboard 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
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 class exam is to provide the students with regular feedback on student learning.
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
Submission Method	Specific Location Venue and time of the midterm test will be announced in the blackboard.
Assessment Criteria	
Return Method	In Class
Feedback Provided	Returned Work - .

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
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:

- Blackboard Course Site: Students will receive communications via the posting of content or announcements on the Blackboard 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.

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

You are entitled to apply for special consideration because adverse circumstances have had an impact on your performance in an assessment item. This includes applying for an extension of time to complete an assessment item. Prior to applying you must refer to the Adverse Circumstances Affecting Assessment Items Procedure, available at https://policies.newcastle.edu.au/document/view-current.php?id=236. All applications for Adverse Circumstances must be lodged via the online Adverse Circumstances system, along with supporting documentation.

Important Policy Information

The 'HELP for Students' tab in UoNline contains important information that all students should be familiar with, including various systems, policies and procedures.

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 blackboard. 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 workshops 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 Blackboard. 4. Detailed assessment criteria for each assessment task and any additional material will be available on the course Blackboard 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 Blackboard. If you have any questions about the marking, discuss it with your demonstrator and if necessary with the course coordinator.

GRADUATE PROFILE STATEMENTS

This course builds students capacity in the following University of Newcastle Bachelor of Computer Science Graduate Profile Statements:

	University of Newcastle Computer Science Graduate Profile Statements	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**	☑	☑	☑	**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.**	☑	☑	☑	**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.**				

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers - Graduate Attributes):

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

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.