

**City University of Hong Kong
Course Syllabus**

**offered by Department of Computer Science
with effect from Semester B 2017/18**

Part I Course Overview

Course Title:	<u>Operating Systems</u>
Course Code:	<u>CS3103</u>
Course Duration:	<u>One semester</u>
Credit Units:	<u>3 credits</u>
Level:	<u>B3</u>
Proposed Area: <i>(for GE courses only)</i>	<input type="checkbox"/> Arts and Humanities <input type="checkbox"/> Study of Societies, Social and Business Organisations <input type="checkbox"/> Science and Technology
Medium of Instruction:	<u>English</u>
Medium of Assessment:	<u>English</u>
Prerequisites: <i>(Course Code and Title)</i>	<u>Nil</u> <u>(CS2115 Computer Organization or</u> <u>EE2004 Microcomputer System)</u> <u><u>And</u></u> <u>(CS2310 Computer Programming or</u> <u>CS2311 Computer Programming or</u> <u>CS2360 Java Programming)</u>
Precursors: <i>(Course Code and Title)</i>	<u>Nil</u>
Equivalent Courses: <i>(Course Code and Title)</i>	<u>Nil</u>
Exclusive Courses: <i>(Course Code and Title)</i>	<u>Nil</u>

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to introduce the concepts, roles and functionality of operating systems, which are an essential part of any computer system. By going through the major areas in the development of operating systems including process management, memory management, scheduling, I/O and disk management, students are expected to gain a broad understanding of key approaches to operating system design and implementation. By discussing the design issues of different approaches, students should be able to analyse the trade-offs and contrast their performance in satisfying different system and application requirements.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs [#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Identify and describe the objectives, roles and functionality of typical operating systems.				
2.	Explain concepts which are fundamental to operating system requirements and designs.				
3.	Discuss design issues of different approaches to operating system design and implementation in order to understand their characteristics and analyse the trade-offs.		✓		
4.	Describe and contrast design and performance of different algorithms proposed for major operating system functionalities such as scheduling, concurrency, memory and disk management.		✓		
5.	Demonstrate ability/skill in applying operating system concepts to develop and implement effective solutions to programming problems.			✓	
		100%			

* If weighting is assigned to CILOs, they should add up to 100%.

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning Outcomes (PILOs) in Section A of Annex.

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)
(TLAs designed to facilitate students' achievement of the CILOs.)

Teaching pattern:

Suggested lecture/tutorial/laboratory mix: 2 hrs. lecture; 1 hr. tutorial.

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lecture	Explain basic concepts and introduce existing approaches to operating system design and implementation.	✓	✓	✓	✓		2 hours/week
Tutorial	Requires students to ask questions actively and apply knowledge to discuss and solve problems.	✓	✓	✓	✓		
Workshop	Requires students to apply operating system concepts to develop and implement solutions to programming problems.					✓	

4. Assessment Tasks/Activities (ATs)
(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4	5		
Continuous Assessment: <u>40%</u>							
Programming assignments		✓			✓	17%	
Case study	✓	✓				8%	
Mid-term quiz	✓	✓	✓	✓		15%	
Examination	✓	✓	✓	✓		60%	
Examination [^] : <u>60%</u> (duration: 2 hours)							
* The weightings should add up to 100%.						100%	

[^] For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Programming assignments	1.1 Understanding and application of operating system concepts 1.2 Ability to develop and implement effective solutions to programming problems.	High	Significant	Moderate	Basic	Not even reaching the marginal levels
2. Case study	2.1 Ability to identify and describe information and operations for supporting management functions provided by system utilities in a commercial operating system.	High	Significant	Moderate	Basic	Not even reaching the marginal levels
3. Mid-term quiz	3.1 Ability to describe basic concepts 3.2 Ability to explain different approaches to operating system design and implementation.	High	Significant	Moderate	Basic	Not even reaching the marginal levels
4. Examination	3.1 Ability to describe basic concepts 3.2 Ability to explain different approaches to operating system design and implementation 3.3 Ability to contrast design and performance of different algorithms proposed for major operating system functionalities.	High	Significant	Moderate	Basic	Not even reaching the marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

Operating system objectives and functions, processes and threads, mutual exclusion, synchronization, deadlock, processor scheduling, memory management, virtual memory, I/O buffering, disk scheduling and management.

Syllabus:

1. Overview and basics of operating system

Objectives and roles of operating system. Interrupt processing. Process and process control blocks. Process states and state diagrams. Modes of execution. Context switching. Multithreading. User-level and kernel-level threads.

2. Concurrency

Race condition. Mutual exclusion. Synchronization. Semaphores. Deadlock. Classic problems.

3. Scheduling

Long-term, medium-term and long-term scheduling. Preemptive and non-preemptive scheduling. Scheduling algorithms.

4. Memory management

Memory hierarchy. Caching. Paging. Segmentation. Virtual memory. Thrashing. Memory allocation. Working sets.

5. Device management

I/O devices. Direct memory access. Buffering. Disk scheduling. Failure recovery.

6. File management

File organization. Directories. Secondary storage management.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	William Stallings (2015). <i>Operating Systems: Internals and Design Principles</i> . Pearson
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2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Abraham Silberschatz, Peter B. Galvin, Grey Gagne (2014). <i>Operating System Concepts</i> . Wiley.
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