澳門理工大學
Universidade Politécnica de Macau
Macao Polytechnic University

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE IN COMPUTING

LEARNING MODULE OUTLINE

Academic Year	2024/2025	Semester	1
Module Code	COMP213		
Learning Module	Operating Systems		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Dennis Wong	Email	cwong@mpu.edu.mo
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MODULE DESCRIPTION

This learning module aims to help students to understand important concepts and algorithms in operating systems. Major components discussed are process management, virtual memory, I/O and file systems. Topics include process description and control, process scheduling, threads, SMP, mutual exclusion and synchronization, partitioning, paging, segmentation, memory management algorithms, disk scheduling and file systems.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Demonstrate an understanding of the fundamental concepts and principles of operating systems; (SM1p)
M2.	Analyze different approaches to operating system design; (EA1p)
M3.	Explain different techniques used for different user needs; (D1p)
M4.	Compare and contrast the key characteristics of modern operating systems. (EP2p)

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3	M4
P1. Select and apply proven methods, tools and techniques to the effective and efficient implementation of information systems;				
P2. Evaluate computer systems in a local area network, and understand the additional requirements for connection to other networks through wide area networks;				
P3. Be competent in system development in the Internet and the web platform;	✔			

P4.	Work independently to design and implement a relational database, with an emphasis on how to organise, maintain and retrieve information from a DBMS;				
P5.	Acquire essential knowledge in specific fields of computing disciplines including multimedia, security and artificial intelligence;				
P6.	Acquire the perceptive skills needed to understand information presented in the form of UML diagram, flow chart or other industry standard formats;		✓	✓	
P7.	Understand the need for and use of the necessary mathematical techniques;				
P8.	Work independently to develop an understanding of, and the knowledge and skills associated with the general support of computer systems and networks;				
P9.	Work as an effective member of a team in the analysis, design and development of software systems;				
P10.	Use project planning and management techniques in systems development;				
P11.	Understand the fundamental and operational issues of computer systems in business environments;				✓
P12.	Equip with adequate written, oral communication and interpersonal skills;				
P13.	Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own;				
P14.	(For Enterprise Information Systems specialization) Gain an in-depth understanding of the information technology related to enterprise information systems, with an emphasis on development of such systems to support business processes;				
P15.	(For Gaming Technology specialization) Acquire the general and advanced knowledge of current technologies and operating environment in the gaming industry;				
P16.	(For Computer Education specialization) Acquire the general and practical knowledge of computer education and its practicing environment in secondary education.				

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1	1. Background	3
	1.1 Review: overview of computer systems	
	1.2 Overview of operating systems	
2 – 4	2. Process Management	9
	2.1 Process description and control	
	2.2 Process scheduling: Round-robin and priority scheduling	
	2.3 Threads, symmetric multiprocessing	

5 – 8	3. Concurrency and Synchronization	12
	3.1 Mutual exclusion and critical section	
	3.2 Lost update problem and busy waiting vs. blocking	
	3.3 Interrupt disabling and spinlock	
	3.4 Semaphores and Readers/Writers problem	
	3.5 Deadlock and starvation	
9 – 12	4. Memory Management	12
	4.1 Partition, paging and segmentation	
	4.2 Virtual memory	
	4.3 Address translation and page fault handling	
	4.4 Memory management – hardware	
	4.5 Memory management algorithms – OS support	
13	5. Input / Output Management and Disk Scheduling	3
	5.1 I/O devices	
	5.2 Organization of I/O functions	
	5.3 I/O buffering	
	5.4 Disk scheduling, RAID	
14 – 15	6. File Management	6
	6.1 Organization: files and directories	
	6.2 Secondary storage management	
	6.3 File systems: FAT and NTFS	

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4
T1. Lectures	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	AHEP3 LOs	ILOs to be Assessed
A1. Assignment / Classwork	25	SM1p, D1p, EP2p	M1, M3, M4
A2. Test	20	SM1p, EP2P, EA1p	M1, M2, M4
A3. Project	15	EP2p, EA1p	M2, M4
A4. Examination	40	SM1p, EA1p	M1, M2

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

Students with an overall score of less than 35 in the coursework must take the re-sit examination even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination must take the re-sit examination even if the overall score for the module is 50 or above.

Students with an overall final grade of less than 35 are NOT allowed to take the re-sit examination.

REQUIRED READINGS

1.   William Stallings (2018). Operating Systems: Internals and Design Principles (9th ed.). Pearson Education Limited.

REFERENCES

1.   A. Silberschatz, P. B. Galvin, G. Gagne (2018). Operating System Concepts (10th ed.), John Wiley & Sons, Inc.

2.   A. S. Tanenbaum and H. Bos (2015). Modern Operating Systems (4th ed.). Pearson Education Limited.

3.   K. N. Billimoria (2018). Hands-on System Programming with Linux. Packt Publishing.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.