PFACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE IN COMPUTING

LEARNING MODULE OUTLINE

Academic Year	2023/2024	Semester	1
Module Code	COMP214		
Learning Module	Computer Networks		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Prof. Hong Shen	Email	hshen@mpu.edu.mo
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MODULE DESCRIPTION

This module introduces the technologies used in modern computer networking from the top to the bottom. The course begins at the application layer and works its way down toward the link layer of the Internet protocol stack. Topics include network services and applications, layered Internet architecture and protocols, congestion control, routing and switching.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

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

M1.	Outline the fundamental design principles of general computer networks (SM1p)
M2.	Demonstrate the Internet architecture and applications (EA1p)
M3.	Explain the theory of basic network performance analysis (EA2p)
M4.	Illustrate some common-used protocols and algorithms in computer networks (EA4p)
M5.	Analyse, specify and design routing strategies for an IP based networking infrastructure (EA4p)
M6.	Capture, filter and inspect packets with network analysis tool such as Wireshark (EP2p,EP3p)

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

PILOs		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
P1.	Select and apply proven methods, tools and techniques to the effective and efficient implementation of information systems on common platforms, including the Internet platform;	✓	✓	✓			
P2.	Acquire essential knowledge in specific fields of computing disciplines including networking, artificial intelligence and security;	✓	✓	✓			

P3.	Apply necessary mathematical techniques to model, analyse and devise solutions to complex problems;	✓	✓	✓			
P4.	Work independently to develop an understanding of, and the knowledge and skills associated with the general support and mitigation of security risks of computer systems and networks;	✓	✓	✓			
P5.	Design and implement relational database, with an emphasis on how to organise, maintain, retrieve and analyse information;	✓	✓	✓			
P6.	Distinguish the fundamental and operational issues of computer systems, with considerations of user, business, ethical, societal and environmental needs;				✓	✓	✓
P7.	Evaluate, prepare and communicate effectively on technical information to both technical and non-technical audience;				✓	✓	✓
P8.	Work as an effective member of a team in the analysis, design and development of software systems, with recognition of requirement to support equality, diversity and inclusion;				✓	✓	✓
P9.	Use project planning, risk management and quality management techniques in solutions to complex problems;				✓	✓	✓
P10.	Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own;				✓	✓	✓
P11.	(For Business Intelligence specialization) Gain an in-depth knowledge of technologies related to data analysis and management of information to support business processes in enterprises;						
P12.	(For Gaming Technology specialization) Acquire the general and advanced knowledge of current technologies and operating environment for the development of the gaming and tourism industry;						
P13.	(For Computer Education specialization) Acquire 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	Introduction to Computer Networks (1)	3
	1.1 Introduction to computer and computer networks	
	1.2 Circuit switching and packet switching	
2	Introduction to Computer Networks (2)	3
	2.1 Delay, loss, and throughput	
	2.2 Protocol layered structure	
3	Application Layer (1)	3
	Principles of network applications	
	The web and HTTP	

4	Application Layer (2)	3
	Electronic Mail in the Internet	
	Domain name system	
5	Transport Layer (1)	3
	Multiplexing and demultiplexing	
	Connectionless transport – UDP (1)	
6	Transport Layer (2)	3
	Connectionless transport – UDP (2)	
	Reliable data transfer (1)	
7	Transport Layer (3)	3
	Reliable data transfer (2)	
	Connection-oriented transport – TCP	
8	Network Layer (1)	3
	Forwarding and routing	
	Virtual-circuit and datagram networks	
9	Network Layer (2)	3
	IP: forwarding and addressing in the Internet	
	Routing algorithm – LS, DV, hierarchical routing (1)	
10	Network Layer (3)	3
	Routing algorithm – LS, DV, hierarchical routing (2)	
11	Network Layer (4)	3
	Broadcast and multicast routing	
12	Link Layer and Local Area Networks (1)	3
	Introduction to link layer services	
	Error-detection and –correction techniques (1)	
13	Link Layer and Local Area Networks (2)	3
	Error-detection and –correction techniques (2)	
	Multiple access protocols (1)	
14	Link Layer and Local Area Networks (3)	3

	Multiple access protocols (2)	
	Link-layer addressing	
15	Link Layer and Local Area Networks (4)	3
	Ethernet – CSMA/CD	
	Link-layer switches	

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**	**M5**	**M6**
T1. Lectures and case studies	✓	✓	✓		✓	✓
T2. In-class lab exercises and discussion				✓		

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

Assessment Activities	**Weighting (%)**	**AHEP3 LO**	**ILOs to be Assessed**
A1. Assignment	35%	EP2p,EP3p, EA1p,EA2p,EA4p	M1, M2, M3, M4, M5, M6
A2. Test	15%	SM1p,EA1p,EA2p,EA4p	M1, M2, M3, M4, M5, M6
A3. Examination	50%	SM1p,EA1p,EA2p,EA4p	M1, M2, M3, M4, M5, M6

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

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. Kurose, J. F. and Ross, K. W. ,2021,. *Computer Networking – A Top-down Approach, 8th edition*, 2021, Addison Wesley.

REFERENCES

1. Peterson, L. L. and Davie, B. S. ,2012. *Computer Networks: a System Approach, 5th edition,* Morgan Kaufmann series in Networking.
2. Andrew S. Tanenbaum and David J. Wetherall, 2010. *Computer Networks, 5th edition,* Prentice Hall.
3. Jill West, Tamara Dean, Jean Andrews, 2018. *Network+ Guide to Networks, 8th edition,* Cengage Learning.

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/.