

University of Macau
Faculty of Science and Technology
Department of Electrical and Computer Engineering

Part A: Course Outline

Course Title	Computer Systems and Network Fundamentals		
Course Code	ECEB256	Year of Study:	3 or 4
Course Mode	Theoretical		
Compulsory/Elective	Elective		
Course Prerequisites	None		
Prerequisite Knowledge	General Mathematics		
Class Schedule	Lecture and tutorial		
Duration	One semester	Credit Units	3
Text Book and References	<ul style="list-style-type: none"> • J. F. Kurose and K. W. Ross, Computer Networking-A Top-Down Approach (5th edition). Addison Wesley Higher Education. • William Stalling, Data and Computer Communications (9th edition), Person Education Ltd. • Behrouz A. Forouzan, Data Communications and Networking (4th edition), Mcgraw-Hill. • Fred Halsall, Data Communications, Computer Networks and Open Systems (4th edition), Addison Wesley. 		
Course Description	<p>This course introduces the concepts and fundamental design principles of modern computer networking in a top-down approach, focusing on the Internet's architecture and protocols. The lecture begins at the application layer and working its way down toward the data link layer and physical layer of the computer network reference model.</p> <p>This course covers fundamental concepts of data and computer communications, with problem-solving tutorials on networking related calculations and in-depth discussion and research on network technologies. Topics include protocol layered architecture, application layer applications, transport layer protocols such as TCP and UDP, network layer routing, link layer multiple access protocols, MAC addresses and Ethernet, packet switching, circuit switching, and physical technologies.</p>		
Topics Covered	<ol style="list-style-type: none"> 1. Introduction to computer networks 2. Application layer 3. Transport Layer, flow control and congestion control 4. Network layer and routing 5. Data link layer, MAC protocols 6. Physical layer 		
Course Objectives	<p>After completing the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Provide a solid foundation of the basics of computer system and networks [a, e, k] 2. Know the characteristics and designs of types of computer network protocols, algorithms and their applications [a, b, c, e, k] 3. Use and understand the advanced techniques, tools, protocols and algorithms in this area[e, k, l] 		
Course Assessment	Assignments and quiz	35%	
	Mid-term test	25%	
	Final exam.	40%	

<p>Relationship to Program Objectives and Outcomes</p>	<p>This course primarily contributes to ECE program outcomes that develop students' abilities to:</p> <ul style="list-style-type: none"> a. Ability to apply knowledge of mathematics, science and engineering. b. Ability to design and conduct experiments, as well as to analyze and interpret data. c. Ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environment, social, political, ethical, health and safety, manufacturability and sustainability. e. Ability to identify, formulate and solve engineering problems. <p>This course secondarily contributes to ECE program outcomes that develop students' abilities to:</p> <ul style="list-style-type: none"> k. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice appropriate to the degree discipline. l. Ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations. 																				
<p>Course Contents and Relationship to Program Criteria</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Week no.</th> <th style="width: 70%;">Topics</th> <th style="width: 20%;">Program Criteria</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2</td> <td>Introduction and Overview of Computer Networks Network concepts, principles of communication protocols, introduction to protocol architecture, introduction to protocol stacks</td> <td style="text-align: center;">BS, CS, ES</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Application Layer Principles of network applications, the principle of web and HTTP, the principle and implementation of electrical mail in the Internet, domain name system.</td> <td style="text-align: center;">CS, ES, DM</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Transport Layer Circuit switching and packet switching, multiplexing and de-multiplexing, TCP and UDP</td> <td style="text-align: center;">BS, CS, ES</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Link Layer and Local Area Network Link layer services, error detection and correction techniques, multiple access protocols, link-layer switches, LAN Technology</td> <td style="text-align: center;">BS, CS, ES</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Physical Layer Analog and digital signal, transmission media, channel capacity and bandwidth</td> <td style="text-align: center;">PS, CS, ES</td> </tr> </tbody> </table>			Week no.	Topics	Program Criteria	2	Introduction and Overview of Computer Networks Network concepts, principles of communication protocols, introduction to protocol architecture, introduction to protocol stacks	BS, CS, ES	3	Application Layer Principles of network applications, the principle of web and HTTP, the principle and implementation of electrical mail in the Internet, domain name system.	CS, ES, DM	3	Transport Layer Circuit switching and packet switching, multiplexing and de-multiplexing, TCP and UDP	BS, CS, ES	3	Link Layer and Local Area Network Link layer services, error detection and correction techniques, multiple access protocols, link-layer switches, LAN Technology	BS, CS, ES	3	Physical Layer Analog and digital signal, transmission media, channel capacity and bandwidth	PS, CS, ES
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<p>Contribution of Course to meet the professional component:</p>	<p>This course prepares students to work professionally in the area of computer networks and related data communication fields. Students should be able to apply knowledge of mathematics and engineering, and explain some common-used protocols and algorithms in computer and communication networks.</p>																				
<p>Course Instructor(s):</p>	<p>Dr. Fen HOU</p>																				
<p>Prepared by:</p>	<p>Dr. Simon FONG</p>																				
<p>Revised by:</p>	<p>Dr. Fen HOU</p>																				

Part B: General Course Information and Policies

Instructor: Dr. Fen HOU

E-mail: fenhou@umac.mo

Office Hours: 10:30am-11:30am on every Thursday and Friday or by appointment

Office: E11-3051

Office ext.:8548

Teaching assistant: Nanmiao Wu (nanmiaowu@gmail.com)

Programme Educational Objectives

1. **Problem Solving:** Graduates have the ability to think in a critical and evaluative manner and to consider a broad perspective, in order to solve technical and nontechnical problems.
2. **Leadership and Communication:** Graduates will provide effective leadership, act in an ethical manner and skills will include the ability to communicate well and to work successfully within diverse groups.
3. **Market Acceptance:** Graduates will have successful careers in the academic environment, industrial and government organizations.
4. **Technical Competence:** Graduates will be technically competent and have a thorough grounding in the fundamentals of math and science in electrical and computer engineering and experience in engineering design. They will be able to use modern engineering techniques, skills, and tools to fulfill societal needs.

Scale: 1 (Highest) to 4 (Lowest)

	Problem Solving	Leadership and Communication	Market Acceptance	Technical Competence
Computer Systems and Network Fundamentals	1		2	2

Remark:

- Objective for “Problem Solving” can be achieved by assignments, quizzes, mid-term exam, final exam and projects.
- Objective for “Leadership and Communication” can be achieved by report writing and presentation. However, leadership training is not given by this course.
- Objective for “Market Acceptance” can be achieved by the course subject that is related to network design which is trained via practice classes.
- Objective for “Technical Competence” can be achieved by using fundamentals of math and science in electrical and electronics engineering and experience in engineering project design and computer simulation.

Program Criteria Policy:

Course VS Program Criteria

Scale: 1 (Highest) to 4 (Lowest)

Course	PS	DIC	BS	CS	ES	DE	LA	CV	DM
Computer Systems and Network Fundamentals	3		3	1	1				

Terms:

Probability and Statistics (PS), Differential and Integral Calculus (DIC), Basic Science (BS), Computer Science (CS), Engineering Science (ES), Differential Equations (DE), Linear Algebra (LA), Complex Variables (CV), Discrete Mathematics (DM)

Relationship of course to Programme Outcomes:

	Program Outcomes											
	a	b	c	d	e	f	g	h	i	j	k	l
Computer Systems and Network Fundamentals	T	P	TP		P						P	P

Course VS Course Outcomes

***T – TEACH; P – PRACTICE; M – MEASURED**

The electrical and computer engineering program outcomes are:

- a. Ability to apply knowledge of mathematics, science and engineering.
- b. Ability to design and conduct experiments.
- c. Ability to design a system, component or process to meet desired needs.
- d. Ability to function on multidisciplinary teams.
- e. Ability to identify, formulate and solve engineering problems.
- f. Understanding of professional and ethical responsibility.
- g. Ability to communicate effectively.
- h. Broad education necessary to understand the impact of engineering solutions in global and societal context.
- i. Recognition of the need for and an ability to engage in life-long learning.
- j. Knowledge of contemporary issues.

- k. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
- l. Ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations

Curriculum Detail

ECEB256 Computer Systems and Network Fundamentals

Timetabled work in hours per week			No of teaching weeks	Total hours	No /Duration of exam papers	Max marks available from:	
Lecturer	Tutorial	Practice				Exams	Course
2.5	1	0.5	14	56	1/3 hours	40	60

Term: 5th or 7th

Hours			Percentage content of					
Lecturer	Tut/Lab	Other	Maths	Basic Science	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies
42	14	0	20	0	35	35	0	10

Design Elements

Please use an "X" to indicate the presence of the specific elements in the course/module/subject

Design Content in Course Work	Design Project	Design Content in Laboratories

Course Assessment Policy:

- Homework assignments will be given to students according to the course progress. The completion of the homework will be fundamental to follow up the tutorial.

- Quiz will be held during the semester.
- Midterm will be held during the semester.
- A three-hour final exam will be performed.

STUDENT DISABILITIES SUPPORT SERVICE

The University of Macau is committed to providing an equal opportunity in education to persons with disabilities. If you are a student with a physical, visual, hearing, speech, learning or psychological impairment(s) which substantially limit your learning and/or activities of daily living, you are encouraged to communicate with your instructors about your impairment(s) and the accommodations you need in your studies. You are also encouraged to contact the Student Disability Support Service of the Student Counselling and Development Section (SCD) in Student Affairs Office, which provides appropriate resources and accommodations to allow each student with a disability to have an equal opportunity in education, university life activities and services at the University of Macau. To learn more about the service, please contact SCD at scd.disability@umac.mo, or 8822 4901 or visit the following website: http://www.umac.mo/sao/scd/sds/aboutus/en/scd_mission.php.