ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Faculty of Electrical and Computing Engineering
COURSE SYLLABUS
Computer Networks

1. CODE AND NUMBER OF CREDITS

CODE	FIEC04705	
NUMBER OF CREDITS: 5	**Theoretical: 5**	**Practical: 0**

2. COURSE DESCRIPTION

This course presents a general vision of computer networks, especially in topics related to Internet technologies. It covers basic principles of data networks with an emphasis on protocols, implementations and design decisions. Furthermore, it introduces basic concepts and terminology related to computer security applied to computer networks.

3. PRE-REQUISITES AND CO-REQUISITES

PRE-REQUISITES	FIEC04622 OBJECT ORIENTED PROGRAMMING
CO-REQUISITES	

4. CORE TEXT AND OTHER REQUIRED REFERENCES FOR THE TEACHING OF THE COURSE

CORE TEXT	1. Behrouz A. Forouzan, Data Communications and Networking, 4th edition, 2007, Mc Graw Hill 2. William A. Shay, Understanding Communications and Networks, 3rd edition, 2004, Thomson Brooks/Cole
REFERENCES	1. William Stallings, Data and Computer Communications, 8th edition, 2007, Prentice Hall 2. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, 5th edition, 2012, Morgan Kaufmann 3. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, 5th Edition, 2010, Addison-Wesley

5. COURSE LEARNING OUTCOMES

At the end of the course, the student will be able to:

1. Apply knowledge of mathematics, probability and statistics to model and analyse some network protocols
2. Demonstrate a comprehension of basic concepts and problems in computer networks
3. Demonstrate an understanding of network engineering principles and design of protocols
4. Explain the layer abstraction and structure of computer networks, making a distinction between problems that occurs in each layer and understanding techniques and algorithms used to solve this problems.
5. Design, implement and analyse simple computer networks
6. Use techniques, abilities and tools of modern networks useful for professional practice.
7. Describe basic terminology, concepts and mechanisms to secure computer networks.

6. COURSE PROGRAM

I. Introduction (2 sessions – 5 hours)
- Basic concepts
- Layered models
- Network performance metrics: bandwidth, latency, round trip time
- Transmission technologies
- Network scales
- Network topologies

II. Physical layer (2 sessions – 5 hours)
- Signals
- Transmission mediums
- Transmission modes
- Conversion from digital to analogic
- Conversion from analogic to digital
- Noise

III. Data link layer and local area networks (6 sessions – 15 hours)

- Basic concepts
- Error detection: algorithms and exercises
- Error correction: Hamming codes
- Addressing: MAC addresses
- Flow control: stop and wait, sliding window
- The channel allocation problem: ALOHA, CSMA, CSMA/CD
- Ethernet: basic concepts
- Switches: Working principles
- Point-to-point protocol (PPP)
- Introduction to structured cabling
- Token Ring
- Interconnecting LANs

IV. Network Layer (7 sessions – 17.5 hours)
- Packet-switched networks
- Virtual-circuit and Datagram networks
- Operations of routers
- IP: IPv4, IPv6, addressing schemes, subnetting
- Routing: algorithms, protocols and exercises
- Subnetting exercises
- The Internet
- ARP

V. Transport Layer (3 sessions – 7.5 hours)
- Introduction to transport services
- Connectionless oriented transport: UDP
- Principles of reliable transmission
- Connection oriented transport: TCP
- Principles of congestion control
- Programming with sockets

VI. Application layer (4 sessions – 10 hours)
- The Web and HTTP
- FTP
- Protocols to send emails
- DNS
- Demonstration of Wireshark
- P2P

VII. Computer networks security(4 sessions – 10 hours)
- Introduction to cryptography
- Symmetric and asymmetric key cryptography
- Network layer security and LANs attacks: sniffing, hijacking, DoS, scanning and smurf
- Application and transport layer security: PGP, SSL, TLS
- Operational security: firewalls, IDs and DMZs

7. WORKLOAD: THEORY/PRACTICE

Two sessions per week, each one of 2.5 hours

8. CONTRIBUTION OF THE COURSE TO THE EDUCATION OF THE STUDENT

This course provides the basis and foundations from the computer networks field. It includes practical exercises on which students use software tools to develop required abilities at designing, implementing and analysing computer networks. Moreover, basic security concepts applied to computer networks are reviewed.

BASIC TRAINING	PROFESSIONAL TRAINING	SOCIAL SKILLS DEVELOPMENT
	X	

9. THE RELATIONSHIP BETWEEN THE LEARNING OUTCOMES OF THE COURSE AND THE LEARNING OUTCOMES OF THE DEGREE PROGRAM

LEARNING OUTCOMES OF THE DEGREE PROGRAM*	CONTRIBUTION (High, Medium, Low)	LEARNING OUTCOMES OF THE COURSE**	THE STUDENT MUST:
a) An ability to apply knowledge of computing and mathematics appropriate to the discipline	Medium	1, 2, 3	Use mathematical operations and numerical conversions to solve exercises about subnetting. Apply knowledge of mathematics to solve problems of routing, error correction, latency, bandwidth, codification or noise.
b) An ability to analyse a problem, and identify and define the computing requirements appropriate to its solution	High	2, 4, 5, 7	Design, implement and analyse simple computer networks. Associate functions and network interconnections to their corresponding TCP/IP and OSI layers. Describe network security issues and some countermeasures to deal with these problems.
c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs	Medium	5, 6, 7	Design, implement and analyse basic computer networks. Create simple networks applications by means of sockets.
d) An ability to function effectively on teams to accomplish a common goal	Low	3, 7	Perform a team assignment of programming with sockets, or a simulator for a protocol, algorithm, or countermeasure to prevent or detect an attack. Prepare an essay that requires a research about an advanced topic in computer networks.
e) An understanding of professional, ethical, legal, security and social issues and responsibilities	Low	7	Demonstrate an ethical and professional behaviour when computer network vulnerabilities are detected. Comprehend ethical aspects involved in computer network administration
f) An ability to communicate effectively with a range of audiences	--		
g) An ability to analyze the local and global impact of computing on individuals, organizations, and society	--		
h) Recognition of the need for and an ability to engage in continuing professional development	--		
i) An ability to use current techniques, skills, and tools necessary for computing practice	--		
j) Ability to lead, manage or undertake projects	--		

10. EVALUATION IN THE COURSE

Evaluation activities	
Exams	x
Tests	x
Homework/tasks	x
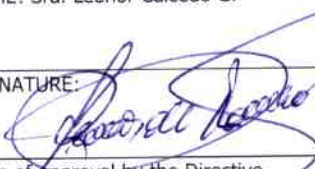
Projects	
Laboratory/Experiments	
Class participation	
Visits	
Other	

11. PERSON RESPONSIBLE FOR THE CREATION OF THE SYLLABUS AND THE DATE OF ITS CREATION

Created by	MSc. Carlos Mera Gómez
Date	May 2013

12. APPROVAL

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Sra. Leonor Caicedo G.	NAME: Ing. Marcos Mendoza V.
SIGNATURE:	SIGNATURE: ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Date of approval by the Directive Council: 2013-334 2013-08-12	Ing. Marcos Mendoza V. DIRECTOR DE LA SECRETARIA TÉCNICA ACADÉMICA

13. VALIDITY OF THE SYLLABUS

RESOLUTION OF THE POLYTECHNIC BOARD:	13-10-269
DATE:	2013-10-17