COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING
ACADEMIC UNIT	DEPARTMENT OF ELECTRONICS ENGINEERING
LEVEL OF STUDIES	UNDERGRADUATE

COURSE CODE	2607001	**SEMESTER**	7

COURSE TITLE	Computer Networks

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
	Lectures	3	6
	Laboratory	2	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialisation Course
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	http://eclass.gunet.gr/courses/NETGU292/

(2) LEARNING OUTCOMES

Learning outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described. *Consult Appendix A* • *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area* • *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B* • *Guidelines for writing Learning Outcomes*

The course aims to give students the necessary knowledge on data networking systems. It covers both theoretical and practical issues related to the way in which computer systems interconnect to exchange information, how they are organized within a global network, as well as architectures and protocols used for secure data exchange and use of network applications. Emphasis is given to data networks over the IP protocol and the web.

Upon successful completion of this course module students possess advanced knowledge, skills and competences in the subject of Computer Networks that enable them to:

1. Demonstrate comprehension of and explain by drawing the operation and organization of computer networks; explain the use of applications over them,
2. Know and use tools for the creation, setup and management of local area networks, computer

interconnection, connection of terminals to the internet, as well as the operation of most common internet protocols,

3. Use tools to analyse and program protocol and configure networking parameters for computer terminal and networking equipment,
4. Analyze and calculate the basic communication parameters of computing systems over a local area network using internet protocols, and explain the way these systems can access the global internet,
5. Work individually or in a group of students or engineers to install, setup and maintain a computer network,
6. Analyse protocols and information exchanged over them using popular networking protocols and software.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
	Respect for difference and multiculturalism
Adapting to new situations	*Respect for the natural environment*
Decision-making	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Working independently	
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work

(3) COURSE CONTENT

Lectures:

Section 1. Introduction to Computer Networks, protocols and data transport

Fundamentals of computer networking and data transmission, computing interconnection architectures, protocols and open systems interconnection, network services and applications, packet networks.

Section 2. Internet organization, operation and access issues to it

Internet, principles of operation and control, its history, organization, presentation of the core network and the access network, and corresponding protocols with reference to OSI layered architecture.

Section 3. Applications, and Web services

Presentation of the application layer of Internet key applications and protocols (HTTP, FTP, SMTP, POP / IMAP), service models, P2P networks, presentation of WWW.

Section 4. Data transmission at the transport layer

Basic operating principles of the transport layer, guaranteed and reliable data transfer, TCP, UDP, sockets, flow control and congestion control.

Section 5. Routing information in packet networks and the internet

Basic principles of routing in packet networks, virtual circuits, ATM, Frame Relay, X25, shortest

path routing algorithms in IP networks.

Section 6. Creating networks and subnetworks over IP

Addressing, masks, subnets, organization of terminal systems in local networks, IPv4, IPv6, NAT.

Section 7 (3 hours). Broadcast information at the datalink layer

Addressing at the datalink layer, point to point information transmission, ARP, virtual LANs.

Section 8. Data security and network attacks

Attacks on the Internet, problems and risks, countermeasures, detection and response to attacks, encryption and privacy protection systems and user authentication using techniques of public-private keys.

Section 9. Media Streaming on the web

Transmission of multimedia information over the internet, multimedia streaming, adaptive video transmission techniques.

Laboratory Experiments:

Lab section A: Basic knowledge – Introduction to protocols

Introduction to layered protocol architecture

Lab section B: Internet applications and the use of protocols in data communications

Presentation and use of Wireshark.

Lab section C: Reliable data transfer over the internet

Presentation and use of Python programming language for socket programming.

Lab section D: Addressing and routing

Presentation and use of GNS3.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of electronic presentation with multimedia content and interactive whiteboard in class, • Student support through the course webpage and the departmental e-learning platform, as well as by videos of lectures, • Electronic communication of instructors and students, through the course webpage and by e-mail. • Use of network protocol analysis software, • Use of network design and analysis software, • Use of software platform for computer systems interconnection and exchange of data.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity,*	Lectures, Laboratory experiments, projects, study. {table below}

Activity	Semester workload (hours)
Lectures	39

etc.	Study for lectures	39
	Laboratory experiments	26
The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS	Report on lab experiments	26
	Individual or group projects	36
	Study and preparation for exams	14
	Course Total	*180*

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Final grade = Theory part grade x 60% + Lab part grade x 40% *Theory Part grade:* • Final exam (90%) • Class participation grade (10%) Final exam includes development questions and computational / problem solving questions. *Lab part grade:* • Midterm evaluation 50% • Final evaluation 50%

(5) ATTACHED BIBLIOGRAPHY

Essential reading
1. Monteiro, J. M., Cruz, R. S., Patrikakis, C. Z., Papaoulakis, N. C., Calafate, C. T., & Nunes, M. S. (2013). Peer-to-Peer Video Streaming. In R. Farrugia, & C. Debono (Eds.), Multimedia Networking and Coding (pp. 254-313). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-2660-7.ch010.
2. Charalampos Z. Patrikakis, Angelos- Christos Anadiotis, Penetrating with DDoS Attacks, (available online: http://pentestmag.com), PenText Magazine, vol2 no 5, Aug 2012, pp [16-22].
3. Pendegraft, N. (2003). The TCP/IP Game. In T. McGill (Ed.), Current Issues in IT Education (pp. 117-124). Hershey, PA: IRM Press. doi:10.4018/978-1-93177-753-7.ch009.

Recommended Books
1. James F. Kurose - Keith W. Ross, Computer Networking, 6th Edition, Addison-Wesley, 2013.
2. Tanenbaum & Wetherall, Computer Networks (5th Edition), Prentice Hall, 2010.
3. Douglas E. Comer, Computer Networks and Internets with Internet Applications, 4th edition, Prentice Hall