

COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	ELECTRICAL AND COMPUTER ENGINEERING DEPT.		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ECE_TEL821	SEMESTER	8
COURSE TITLE	Advanced Networking		
INDEPENDENT TEACHING ACTIVITIES <i>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</i>		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	
Projects/ Practice exercises		1	
Laboratory			
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).</i>		4	5
COURSE TYPE <i>general background, special background, specialised, general knowledge, skills development</i>	Specialised (Signals, Telecommunications and Networks)		
PREREQUISITE COURSES:	No. Students are advised to have already attended the course: Computer Networks		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No.		
COURSE WEBSITE (URL)	https://www.ece.uop.gr/		

(2) LEARNING OUTCOMES

<p>Learning outcomes</p> <p><i>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.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning</i> <p><i>and Appendix B</i></p> <ul style="list-style-type: none"> • <i>Guidelines for writing Learning Outcomes</i>
<p>Upon successful completion of the course, students will have achieved the following outcome in the field of:</p> <p>Knowledge</p> <ul style="list-style-type: none"> ✓ <i>Understand special and advanced concepts of Networking.</i> ✓ <i>Understand mathematical methods related to advanced computer networking topics.</i> ✓ <i>Understand the basic functions of the IPv6 protocol.</i> ✓ <i>Identify and understand the different techniques for achieving quality services</i> ✓ <i>Understand broadband issues.</i>

- ✓ *Understand security issues when transmitting data and methods for protecting network devices and users.*
- ✓ *Study the way in which different technologies and techniques for data transfer from end to end are interconnected.*
- ✓ *To study the protocols of the Networks and how they can help in the management of networks and their implementation.*

Skills

- ✓ Deal with complex problems of the Advanced and Special Issues of Networking in a systematic and creative way.
- ✓ Understand and analyze and implement functionalities of broadband networks.
- ✓ Connect different networks and technologies (wireless networks, TCP / IP, ATM)
- ✓ Understand and analyze the conditions for service quality to support multimedia applications such as Internet telephony.
- ✓ Recognize modern problems and/or new challenges in the subject matter of Computer Networks.

Abilities

- ✓ Independently design and implement tasks.
- ✓ Communicate effectively with experts and non-experts.
- ✓ Deal with complex and advanced problems in Networking both systematically and creatively.
- ✓ Utilize software tools for network analysis and data interpretation.
- ✓ Work and cooperate with their counterparts as a team to address common technical problems.
- ✓ Develop new skills at a higher level.

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?

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

- ✓ Search, analyze and synthesize data and information using the necessary technologies.
- ✓ Develop ability to work in independently
- ✓ Teamwork
- ✓ Producing free, creative and inductive thinking

(3) SYLLABUS

Theory Lectures:

Lectures (1-3) Service Quality of Service

- ✓ Introduction
- ✓ Quality metrics
- ✓ QoS types
- ✓ Quality mechanisms at the Data link layer
- ✓ Quality mechanisms at network and transport layers
- ✓ Internet Service Quality (IntServ, Diffserv)
- ✓ Service Level Agreement

Lectures (4-6) IPv6 Protocol

- ✓ Structure of the IPv6 protocol
- ✓ Addressing
- ✓ Routers
- ✓ Comparison of IPv4, IPv6
- ✓ Quality of Services
- ✓ IP Techniques Going from IPv4 to IPv6

Lectures (7-8) Broadband Networks

- ✓ X.25
- ✓ And Frame Relay
- ✓ ATM

Lectures (9-12) Network Security

- ✓ Introduction to Network Security (Objectives, Attacks, Services and Techniques)
- ✓ Confidentiality (symmetric key cryptography, Public key)
- ✓ Symmetric key algorithms, public key, Public key management at network level.
- ✓ Digital network signatures.
- ✓ Certification of identity
- ✓ IPSec
- ✓ Internet Security (viruses, Trojan, worms, DOS)
- ✓ Firewalls
- ✓ Email security
- ✓ Intrusion Detection & prevention systems

Lecture 13 All IP Networks

- ✓ Network Architecture
- ✓ IP and ATM
- ✓ Mobile IP

Activities / Exercises

Students will need to deliver a series of exercises using computer network simulation software. Specifically, free computer simulator software (OPNET IT GURU, NS2) will be used to understand the operation of protocols, mechanisms, and algorithms presented in lectures

(4) TEACHING and LEARNING METHODS - EVALUATION

<p>DELIVERY</p> <p><i>Face-to-face, Distance learning, etc.</i></p>	<p><i>Face-to-face</i></p>													
<p>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</p> <p><i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<ul style="list-style-type: none"> - Lectures' slides (ppt) that assist the theoretical part, are being posted at the e-class platform for the students during the semester . - Communication is also supported by e-Class platform (distribution of slides, supplementary material, announcements, links and bibliography, etc.). 													
<p>TEACHING METHODS</p> <p><i>The manner and methods of teaching are described in detail.</i></p> <p><i>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, etc.</i></p> <p><i>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</i></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Activity</th> <th style="text-align: center;">Semester workload</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Lectures</td> <td style="text-align: center;">39</td> </tr> <tr> <td style="text-align: center;">tutoring exercises</td> <td style="text-align: center;">13</td> </tr> <tr> <td style="text-align: center;">Study and analysis of bibliography</td> <td style="text-align: center;">60</td> </tr> <tr> <td style="text-align: center;">Project assignment</td> <td style="text-align: center;">13</td> </tr> <tr> <td style="text-align: center;">Course Total</td> <td style="text-align: center;">125 hours (5 ECTS)</td> </tr> </tbody> </table>		Activity	Semester workload	Lectures	39	tutoring exercises	13	Study and analysis of bibliography	60	Project assignment	13	Course Total	125 hours (5 ECTS)
Activity	Semester workload													
Lectures	39													
tutoring exercises	13													
Study and analysis of bibliography	60													
Project assignment	13													
Course Total	125 hours (5 ECTS)													
<p>STUDENT PERFORMANCE EVALUATION</p> <p><i>Description of the evaluation procedure</i></p> <p><i>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</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<p>The evaluation is done by:</p> <p style="margin-left: 20px;">(a) Written final exam (60%).</p> <p style="margin-left: 20px;">(b) Works (40%) prepared by groups of students.</p> <p>The final score is calculated: T.B. = (a) * 60% + (b) * 40%</p> <p>The subject matter and the evaluation process are communicated to the students in the lecture hall and in the e-class.</p>													

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. W. Stallings, DATA AND COMPUTER COMMUNICATIONS, Pearson; 10th ed., 2013.
2. A. Forouzan, F. Mosharraf, Computer Networks: A Top Down Approach 1st Ed., McGraw-Hill Education, 2011.
3. A. Forouzan, Data communications and networking, 5th edition, McGraw-Hill, 2013.
4. J. Kurose, K. W. Ross., Computer Network A - Topdown Approach, Pearson; 7th ed., 2016
5. L. L. Peterson, B. S. Davie, Computer Networks: A Systems Approach, ELSEVIER, 5th ed. 2011.
6. A.S. Tanenbaum. D.J. Wetherall Computer Networks, 5th Ed., Pearson, 2012)
7. «Ειδικά Θέματα Δικτύων και Υπηρεσιών», Ε. Καπουλας, Χ. Μπούρας, Ε. Γιαννακά, Θ. Τσιάτσος, Ελληνικά Γράμματα, 2004
8. Network Security Essentials: Applications and Standards, 6th ed., William Stallings, Pearson, 2016
9. Cryptography And Network Security, W. Stallings, 7th Ed., Pearson, 2017