Course title	**Computer Communication Networks**
Course code	22A410
Type of course	Compulsory core course.
Level of course	Undergraduate
Year of study	2nd
Semester	4th
ECTS credits	5
Name of lecturer(s)	Michael Logothetis, Spyros Denazis, Dimitris Lymperopoulos
Learning outcomes	At the end of this course the student should be familiar with the basic operating principles of computer networks and especially of the INTERNET (TCP/IP protocols). He/she should have consolidated the layer philosophy (Internet protocol suite), the goal of each layer in the Internet, and how the goal is realized by a protocol. Also, the student should understand how a data-packet is transmitted from source to destination, as well as the various delay elements of this transmission and the various loss reasons.
Competences	Handling IPv4 addresses (LAN design) - Finding a Shortest path - Design of a simple reliable communication protocol - Communication with other network engineers/managers and especially for INTERNET issues - Use of OPNET.
Prerequisites	Introduction to Communications (course of the 3rd year).
Course contents	• **Introduction:** Computer Networks and the Internet. Communication Protocol. Open Systems Interconnection. The protocol layers stack of the Internet. The Network Edge. The Network Core. Networks with Virtual Circuits and Datagrams. Delay and Loss in Packet-Switched Networks. Delay and Loss in Circuit-Switched Networks. • **Elementary teletraffic theory** • **Application Layer (AL):** Principles of AL Protocols**.** WEB – HTTP, FTP, SMTP, DNS. • **Transport Layer (TL):** The goal. The TL of the Internet. Basic multiplexing/de-multiplexing functions in TL. The User Datagram Protocol (UDP) (Segment structure, Checksum). Principles of Reliable Data Transfer. Stop & Wait protocol. Pipelining. The Transport Control Protocol (TCP). The TCP connection. Round-Trip time. Determination of the length of the "Sequence Numbers" field**.** Flow control. Congestion Control. Best Transmission Window Size. • **Network Layer:** The goal. The Service Model (Virtual Circuits – Datagrams). Routing. Centralized and distributed routing algorithms. Hierarchical Routing. The Internet Protocol (IP). IPv4 addresses. Subnets definition through subnet mask. Moving a Datagram from Source to Destination: Addressing, Routing and Forwarding. The ICMP Protocol. Routing in the Internet. Intra-Autonomous System Routing: RIP, OSPF. Inter-Autonomous System Routing: BGP. IPv6. Transition from IPv4 to IPv6. Inside a Router. Head of the Line Blocking. Virtual Output Queues. • **Data Link Layer (DLL):** The goal. The services. Broadcast channels and PPP. Adapters Communicating. Error Detection and Error Corrections Techniques. MAC – Channel Partitioning Protocols: TDM, FDM,CDMA. – Random Access Protocols: Aloha, Slotted Aloha, CSMA, CSMA/CD (Ethernet). – Taking-Turns Protocols: Polling – Token Pass. Hubs, Bridges and Switches (comparison with routers). The LAN as a DLL protocol. • **LABARATORY EXCERCISES (DEMONSTRATIONS BASED ON OPNET)**
Recommended reading	1) James Kurose, Keith Rose, "Computer Networking: A Top Down Approach Featuring the Internet", Pearson Education Inc. (6th edition). 2) Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", Prentice Hall, 2011. (5th edition). 3) Michael D. Logothetis (Ed.), LABORATORY EXERCISES OF COMPUTER COMMUNICATION NNETWORKS**,** Handbook in Greek, University of Patras, 2008. 4) Emad Aboelela, "Network Simulation Experiment Manual".
Teaching and learning methods	Lectures (3 hours per week including 1 hour seminars) using slides from book (1). During seminars, the instructor solves exercises on the blackboard by using a chalk. However, the student can find these exercises through the educational tool called "eclass" at: http://eclass.upatras.gr/ (free access). Students who have learned the content of the slides as they have been explained in the classroom, as well as the entire content of the eclass-website, are strong candidates for the best performance in the final exam (grade 10).
Assessment and grading methods	The grading is based on final written exam, which is carried out with closed books (mathematical formulas will accompany the exercises/problems in the form of memos). If the final written exam is successful (i.e. grade 5, at least), then, for those students who have participated in 30-45min tests (they are carried out 2 times during the semester), their performance in these tests is taken into account so that the grade from the written exams can be increased by 0.5 or 1 grade. Students can proceed to the final written exam, only when they have attended the Lab.
Language of instruction	Lectures and Seminars/Labs are taught in Greek. Foreign visiting students will be supported with English materials, including laboratory handouts, and final examination in English.