University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS Credits**
COMP-458	Network Protocols	6
Department	**Semester**	**Prerequisites**
Computer Science	Fall, Spring	COMP-358, COMP-212
Type of Course	**Field**	**Language of Instruction**
Elective	Computer Science	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	4th	Dr Constandinos Mavromoustakis
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- identify, critically compare and sketch communication systems with regards to communication protocols used, and build upon the introductory material covered in COMP-358 Networks and Data Communications (Network Architectures. Layering and Protocols)
- emphasize on network protocols of different network architectures and thoroughly discuss aspects dealing with associated networked applications
- critically compare and evaluate in depth the TCP/IP suite of protocols examining IP and related protocols (ICMP, ARP), IP routing (BGP, OSPF), Mobile IP, Transport Layer protocols (TCP, UDP), and related specifications (SMTP, HTTP, DNS), IGPs, EGPs, and Routing Protocols (RIP)
- determine and demonstrate the Protocol Suite of TCP/IP (ARP/RFC 826, Reverse Address Resolution Protocol (RARP), RIP Operational Types etc.), multiservice servers using TCP/UDP, tunneling at the transport and application levels, Application level gateways, External data representation
- explore the basic concepts of Internet Protocol Version 6 (IPv6) including IPv6 routing comparison with IPv4 routing using CIDR. OSPF, RIP, IDRP, and IS-IS and modifications
- critically assess and acquire a deep knowledge on the file P2P sharing existing protocols
- provide students with deep knowledge for the behavior of each examined protocol via Simulation techniques and tools
- design and implement in real-time a new protocol based on an already existing using a simulation tool/ develop a simulation in evaluating an already implemented protocol/Simulation experimental procedure
- design and implement in real-time a protocol-based scenario

Learning Outcomes:

After completion of the course students are expected to be able to:

1. recognize and demonstrate communication protocols used in layered and in systems that use protocols/ identify the major communications protocols/ distinguish why different protocols are used for different applications
2. distinguish the concepts and the underlying infrastructure of such systems and systems hosting the Protocol Suite of TCP/IP
3. identify the issues and problems, together with the solutions in implementing communication systems
4. explain various protocol paradigms and the subsequent issues that arise
5. discuss and cover in detail all aspects of the basic protocols of the infrastructure being used up-to-date, and the protocols which support the Internet Protocol
6. make students aware and practically demonstrate the Service principles and definitions of modern wired and wireless protocols in terms of Addressing, routing principles (distance vector, link state, inter-domain), mobile host routing, topology formation and identification
7. classify and differentiate in depth all conceptual aspects of the IPv6
8. perform experimental network analysis and design through different network protocols/ middleware protocol support
9. design and implement in real-time a protocol-based scenario in evaluating an already implemented protocol
10. research in state-of-the art areas and future trends in the networking environment

Course Contents:

1. Introduction. Network Architectures. Layering and Protocols.
2. Review of Data link Layer. Ethernet and Wireless Medium access.
3. Network Layer Protocols. Internet Protocol: Service Definition, Addressing, ICMP, ARP, DHCP. Routing principles (distance vector, link state, inter-domain), mobile host routing, IPv6.
4. Transport layer Protocols. User Datagram Protocol (UDP) definition, Transmission Control Protocol (TCP)connection management, TCP congestion control (slow start, fast retransmit and recovery).
5. Client-Server Programming. TCP Client, TCP Server, Application Data management, UDP Client/Server.
6. BitTorrent and other peer-to-peer file sharing protocols. Used for distributing large amounts of data.
7. Networked Applications. E-mail Applications (SMTP), Domain Name System, the Web and HTTP, FTP, TELNET.
8. Classification of Networking Protocols. Adaptive/ non-adaptive and hybrid or/and based on resources' constraints.
9. Perform network analysis and design. Different network protocols/ middleware protocol support.
10. Use SimTools to validate and evaluate the determined Protocols.

Learning Activities and Teaching Methods:

Lectures, Lab Presentations, Lab Tutorials, Theoretical Exercises and Assignments.

Assessment Methods:

Tests/Quizes, Design project, Homework, Project, Mid-Term, Final Exam.

Required Textbooks/Reading:

Authors	**Title**	**Publisher**	**Year**	**ISBN**
James F. Kurose and Keith W. Ross	Computer Networking: A Top-Down Approach Featuring the Internet	Addison Wesley, 2nd Edition	2002	0-201-97699-4

Recommended Textbooks/Reading:

Authors	**Title**	**Publisher**	**Year**	**ISBN**
Andrew S. Tanenbaum, Maarten Van Steen	Distributed Systems: Principles and Paradigms	Prentice Hall, 2nd edition	2006	978-013239227
W. Richard Stevens	TCP/IP Illustrated, Volume 1 The Protocols	Addison-Wesley		0-201-63346-9