



Course Syllabus

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

Course Objectives:

The main objectives of the course are to:

- Cover in depth the Network Architectures, Layering and the related utilized Protocols.
- Emphasize on network protocols instead of network architectures and include programming of networked applications.
- Cover 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).
- 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.
- Internet Protocol Version 6 (IPv6) including IPv6 routing comparison with IPv4 routing using CIDR. OSPF, RIP, IDRP, and IS-IS and modifications.
- Cover in a great extend the P2P resource distributing/sharing protocols.
- Enable students to learn about the behavior of each examined protocol via Simulation techniques.
- Realize concepts of ASN.1 and XDR (External Data Representation), H.323 and Session Description Protocol (SDP) and explain briefly their purpose of existence.
- Design a new protocol based on an already existing using a simulation tool/ develop a simulation in evaluating an already implemented protocol/Simulation experimental procedure/simulating a protocol based scenario.

Learning Outcomes:

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

- Recognize communication protocols used in layered and in systems that use protocols/ identify the major communications protocols/ know why different protocols are used for different applications.
- Distinguish the concepts and the underlying infrastructure of such systems and systems hosting the Protocol Suite of TCP/IP.
- Identify the issues and problems, together with the solutions in implementing communication systems.
- Develop a simulation in evaluating an already implemented protocol.
- Demonstrate and analyze the basic conceptual models for widely deployed protocols.
- Explain various protocol paradigms and the subsequent issues that arise.
- Learn the basic protocols of the infrastructure being used upto now, and the protocols which support the Internet Protocol.
- Learn about the Service principles and definitions, Addressing, ICMP, ARP, DHCP. Routing principles (distance vector, link state, inter-domain), mobile host routing.
- Learn about the IPv6 and the difference with the protocols which are supported by IPv6.
- Perform network analysis and design through different network protocols/ middleware protocol support.
- Be aware of the future trends in the networking environment.

Course Content:

1. Introduction. Network Architectures. Layering and Protocols.
2. Review of Data link Layer. Ethernet and Wireless Medium access.
3. Network Layer Protocols. Internet Protocol: Learn about the Service Definition, Addressing, ICMP, ARP, DHCP. Routing principles (distance vector, link state, inter-domain), mobile host routing, IPv6.
4. Concepts of ASN.1 and XDR (External Data Representation), H.323 and Session Description Protocol (SDP) and explain similar contexts and their purpose of existence.
5. Transport layer Protocols. User Datagram Protocol (UDP) definition, Transmission Control Protocol (TCP) connection management, TCP congestion control (slow start, fast retransmit and recovery).
6. Client-Server Programming. TCP Client, TCP Server, Application Data management, UDP Client/Server.
7. BitTorrent and other peer-to-peer file sharing protocols. Protocols for efficient distribution of large amounts of data.

8. Networked Applications. E-mail Applications (SMTP), Domain Name System, the Web and HTTP, FTP, TELNET.
9. Classification of Networking Protocols. Adaptive/ non-adaptive and hybrid or/and based on resources' constraints.
10. Perform network analysis and design. Different network protocols/ middleware protocol support.
11. Design a simple UDP-based protocol for retrieving files from a server with specific requirements based on network-centric parameters. (i.e. authentication and stop-and-wait transmission of the data may be used).
12. Use SimTools to validate and evaluate the determined Protocols.

*Including Emulation/Simulation experiments for certain network scenarios using Core packages by Oracle, NS-3 and other integrated packages

Learning Activities and Teaching Methods:

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

Assessment Methods:

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

Required Textbooks / Readings:

| Title | Author(s) | Publisher | Year | ISBN |
|---|---------------|---|------|---|
| Core Network protocols | Hartpence B. | O'Reilly and Nova Publisher- O'Reilly Media | 2016 | ISBN 10: 1449306535 ISBN 13: 9781449306533 |
| Web Services: Principles and Technology | Papazoglou M. | Prentice Hall | 2014 | ISBN-10: 0321155556 ISBN-13: 9780321155559 |

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| Internet & World Wide Web How to Program, 5/e | Deitel M.H. and Deitel P.J. | Pearson Inc. | 2015 | ISBN: 0-13-1752421 |
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Recommended Textbooks / Readings:

| Title | Author(s) | Publisher | Year | ISBN |
|--|----------------------------------|------------------|-------------|---|
| TCP/IP sockets in C, Practical Guide for Programmers | Donahoo J.M. and Calvert K.L. | Morgan Kaufman | 2014 | ISBN-10: 1- 55860-826-5 |
| TCP/IP Illustrated: The Implementation, Vol. 2 | Wright G, Stevens R | Addison-Wesley | 2012 | ISBN-10: 020163354X ISBN-13: 978- 0201633542 |
| Core Web Programming | Hall M. and Brown L. | Prentice Hall | 2014 | 0-13-089793-0 |