



## Course Syllabus

<b>Course Code</b>	<b>Course Title</b>	<b>ECTS Credits</b>
COMP-358	Networks and Data Communication	6
<b>Prerequisites</b>	<b>Department</b>	<b>Semester</b>
COMP-113 and MATH-196	Computer Science	Fall, Spring
<b>Type of Course</b>	<b>Field</b>	<b>Language of Instruction</b>
Required for Computer Science Elective for Data Science	Computer Science	English
<b>Level of Course</b>	<b>Lecturer(s)</b>	<b>Year of Study</b>
1 <sup>st</sup> Cycle	Dr. Constandinos Mavromoustakis	3 <sup>rd</sup>
<b>Mode of Delivery</b>	<b>Work Placement</b>	<b>Corequisites</b>
Face-to-face	N/A	None

### Course Objectives:

The main objectives of the course are to:

- demonstrate and analyze the basic computer networking technologies and the required infrastructure which comprises the key steps involved in the communication process
- establish a solid knowledge of the layered approach that makes design, implementation and operation of extensive networks possible. Discuss and explain thoroughly the 7-layer OSI network model (each layer and its responsibilities) and identify as well as realize the definitions explored in the TCP/IP suite of protocols and the networked applications supported by it
- thoroughly discuss and acquire the knowledge of the basic protocols involved in wired/wireless communication process. These include the characteristics of the required infrastructure for Local Area Networks (MAC-CSMA-CD/Ethernet, Token Ring, FDDI, and others), and for Wide Area Networks using the TCP/IP, UDP/IP
- determine, apply and demonstrate as well as compare different illustrated network performance concepts and traffic aspects for Quality of Service (QoS) in broadband communication
- demonstrate and analyze as well as critically compare and evaluate the basic design principles of wired and wireless communication networks. Moreover, to demonstrate and

critically compare the way to model and the way to compare the structural performance for some commonly used network architectures

### Learning Outcomes:

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

- provide a good realization and clear identification of the physical and logical as well as the electrical characteristics of digital signals and the basic methods of data transmission
- acknowledge the importance of the ISO 7-layer reference model
- critically assess the concepts and requirements hosted in communication protocols and provide an overview of Data Communication Standards
- figure the area of computer networks in terms of connectivity, mobility and the role of metrics, with emphasis on the range of communication protocols utilized
- acquire the knowledge of the basic protocols involved in wired/wireless communication process. Local Area Networks (MAC-CSMA-CD/Ethernet, Token Ring, FDDI, and others), and for Wide Area Networks using the TCP/IP, UDP/IP
- conceptual development of the basic design principles in wired and wireless communication networks
- analyze the structural performance for some commonly used network architectures/ identify the functions and architectures of LAN and WAN/ analyze and design LAN architecture and the design and deployment requirements
- demonstrate and analyze the electrical interface and the basics of digital data transmission
- demonstrate and critically assess the need for data communication standards and the underlying technology used in wired and wireless communication models
- analyze as well as critically compare a broad knowledge of the protocols used in various types of computer networks
- critically compare and evaluate and identify the principles of Open Systems and the Transport/Application protocols, which facilitate them
- identify the utilized fundamentals and technologies of physical, data-link and network layers
- to link different network performance concepts and traffic issues for Quality of Service (QoS) in broadband communication
- research in state-of-the art areas in data and network communication systems

### Course Content:

1. Basic Concepts of connectivity and networking. Uses of Computer Networks, Network Architectures and topologies, Layering and Protocols, Metric Units, Basic Probability Theory.
2. Network Interworking concepts-Process for communication between devices-TCP/IP

Model and OSI Model comparison.

3. Physical Layer. Theoretical basis for data communication. Guided Transmission Media. Wireless Transmission. Communication Satellites.
4. Data-Link Layer Encoding, Framing and Synchronization, Error Detection and Correction, Flow control and the sliding window algorithm.
5. Principles of Medium Access Control. Ethernet (802.3), Token Ring (802.5), FDDI, Wireless (802.11).
6. Network Layer, Switching and Routing. Packet vs Circuit switching, Protocols and Services, Internetworking protocols, IP, ICMP, ARP, DHCP, VPN. Routing principles, The Network Layer and its usage in the Internet.
7. Transport layer Services and Protocols. User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP congestion control.
8. Applications. Networked applications (mail, file transfer, www), multimedia applications (RTP, H.323). Case studies of commonly used applications.
9. Network Queuing mechanisms and monitoring foundations of networking performance evaluation.
10. IP Layer Issues, Congestion Control Algorithms, Packet Switching/ Mobility issues, QoS, IP Layer & Internet.
11. Overview of ATM Network Protocols and Architectures, Operations and related protocols used.
12. Specific case-study scenarios using network simulation and emulation tools\*.

\*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 Exercises and Assignments.

### **Assessment Methods:**

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

**Required Textbooks / Readings:**

Title	Author(s)	Publisher	Year	ISBN
Computer Networks	A.S. Tanenbanum, D. J. Wetherall	Pearson; 6th edition (March 3, 2021)	2021	ISBN-10: 1292374063  ISBN-13: 9781292374062

**Recommended Textbooks / Readings:**

Title	Author(s)	Publisher	Year	ISBN
Computer Networks: A Systems Approach	L. Peterson and B. Davie	Morgan Kaufmann Series in Networking/ 6th Edition - October 1, 2020	2020	Paperback ISBN: 9780128182000  eBook ISBN: 9780128182017
Computer Networking, a top-down approach featuring the Internet	J.K.Kurose and K.W.Ross	Pearson; 8th edition (March 30, 2020)	2020	0-321-26976-4