



University of Nicosia, Cyprus

<b>Course Code</b> ECE-354	<b>Course Title</b> Data Communication Technologies	<b>ECTS Credits</b> 6
<b>Department</b> Engineering	<b>Semester</b> Fall or Spring	<b>Prerequisites</b> ECE-324
<b>Type of Course</b> Elective	<b>Field</b> Engineering	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Year of Study</b> 3 <sup>rd</sup>	<b>Lecturer(s)</b> Dr Antonis Hadjiantonis
<b>Mode of Delivery</b> Face-to-face	<b>Work Placement</b> N/A	<b>Co-requisite</b> None

**Objectives of the Course:**

The main objectives of the course are to:

- refresh the OSI layer model and reanalyze the basic concepts used in networks (like multiplexing, switching etc.)
- introduce the major high-speed network architectures, technologies and standards of today's telecom
- provide a through analysis of SONET/SDH operation and position it in terms of current and future telecom trends (why it came to be, where is it strong, where is it weak)
- introduce the ATM and investigate why it was strong and why is it now weak; perform basic ATM network designs and explore the concept of statistical multiplexing via simulation
- provide the MPLS fundamentals; provide comparison with ATM
- introduce the necessary building blocks (optical Mux, Dmux and OXC's) for  $\lambda$ -routed networks and investigate their performance via simulation.
- help develop a circuit-switched network simulation tool(using NS2 and/or MATLAB and/or C/C++) that measures performance in terms of blocking probability

**Learning Outcomes:**

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

1. translate the networking layers
2. identify the strengths and weaknesses of IP
3. determine the operation and principles of SONET/SDH
4. identify the strong points of ATM (QoS) and why it failed to deliver
5. demonstrate basic knowledge on what MPLS is and why it tends to replace ATM
6. criticize the "IP/MPLS-over-ATM-over-SONET/SDH-over-DWDM" network overlaying; why is it used? Why is it unwanted?
7. develop and use a tool for a network-wide simulation, through which to gain

insight on network performance

**Course Contents:**

1. Intro. (OSI layers, transmission systems, multiplexing concepts)
2. Packet and Circuit switching technologies
3. SDH/SONET multiplexing structure and overheads. Topologies and applications, protection mechanisms.
4. Asynchronous Transfer Mode (ATM): Standards, packet format, segmentation and reassembly). ATM switches, ATM adaptation layer, Virtual Paths (PVC, SVC), ATM connections, traffic shaping, Quality of service. IP and ATM convergence
5. MPLS switching, label POP/PUSH/SWAP, label stacking and tunneling. Intro to GMPLS
6. WDM network elements, network topologies, applications and relation to SDH and other (client) technologies. Protection in WDM networks

**Learning Activities and Teaching Methods:**

Lectures

**Assessment Methods:**

Homework, Computer Simulation Projects, Mid-Term, Final Exam.

**Required Textbooks/Reading:**

<b>Authors</b>	<b>Title</b>	<b>Publisher</b>	<b>Year</b>	<b>ISBN</b>
William Stallings	Data and Computer Communication	Pearson Education	2009	0-13-507139-9

**Recommended Textbooks/Reading:**

<b>Authors</b>	<b>Title</b>	<b>Publisher</b>	<b>Year</b>	<b>ISBN</b>
Behrouz Forouzan	Communications and Networking	McGraw Hill	2007	007-125442-0
Jose M. Caballero, Fransisco Hens, Roger Segura and Andreu Guimera	Installation and Maintenance of SDH/SONET, ATM, xDSL and Synchronization Networks	ARTECH HOUSE INC.	2003	1-58053-525-9