

Course Title	Computer Networks & the Internet				
Course Code	CSC645				
Course Type	Compulsory				
Level	Master (2 nd cycle)				
Year / Semester	1 st year/ 1 st semester				
Teacher's Name	TBA				
ECTS	10	Lectures / week	3 Hours/ 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	To provide an overview of the broad and constantly emerging field of data communications and computer networks. Data communication is discussed as the necessary tool for understanding computer communication networks.				
Learning Outcomes	<p>Upon successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • State and identify concepts relating to data communications; communication protocols and layered protocol architectures • State and interpret protocol communication standards like OSI and TCP/IP as used in computer networking and internetworking. • Recognize, explain and discuss data transmission fundamentals and types of media (both wired and wireless) • Define and discuss data link control protocols and their functionality • Recall, explain and compare multiplexing techniques and their applications • Define, explain and exemplify concepts related to Local Area Networks; their topologies and protocols; their types and transmission technologies • Describe the process of routing, appraise different control protocols and critically evaluate them • Recognize congestion, examine congestion control methods, value different congestion control methods • Describe, explain and classify types of security attacks; types and algorithms of encryption; security functionality in IP versions 4 and 6 • Compare different network designs, develop networks designs for given parameters 				
Prerequisites	CSC615, CSC620	Co-requisites	CSC625		
Course Content	<p>Introduction/Revision:</p> <p>Communication systems, entities and components. Computer networks as communication system; their topologies and types.</p>				

Communication protocols, layered communications and protocols architectures. The OSI and TCP/IP standards; Physical Layer

Data communication systems: transmission, impairments and media; Data transmission basics; frequency concepts, bandwidth, spectrum; data rate and bandwidth. Analog and digital transmission; wired transmission impairments. Transmission media and impairments for both wired (UTP, STP, Coaxial, Fiber) and wireless (Microwave, Radio, Infrared). Signal encoding techniques; analog-to-digital (and visa-versa) data-to-signal conversion

Medium Access Sublayer: Communication techniques; Data Link Control; Multiplexing. Static and dynamic allocation. Various types of multiple access protocols: ALOHA, CSMA, Collision free protocols, limited contention protocols and the wireless LAN protocol (802.11). Ethernet: Manchester encoding, the Ethernet MAC sublayer protocol and the Binary exponential backoff algorithm.

Synchronous & asynchronous transmission, Error control: types, detection and correction. Flow control: Stop-and-wait, Sliding-window, Automatic Repeat Request. The High-level Data Link Control protocol: modes, frame types and operation. Frequency Division Multiplexing, Synchronous and Statistical Time Division Multiplexing, multiplexing applications (ADSL)

Network Layer Architecture and Performance Evaluation: The concept of routing algorithms is described (Optimally principle, shortest path routing, flooding, distance vector routing etc.). Also the congestion control mechanism is presented in order to meet the Quality of Service requirements specified. The importance of QoS is stressed and techniques for achieving good QoS will be presented. Performance evaluation is also addressed through a mathematical approach including queuing theory and simulation tools such as NS2 and MATLAB. Examples of networking architectures and protocols such as DiffServ, IPv6 and MPLS will be stressed at this point.

Traffic Modeling and Traffic Engineering: In order to avoid congestion and ensure that users get their required Quality of Service (QoS) guarantees, Traffic Control and Management has to be employed. In addition Congestion Control is employed to reduce or event prevent congestion. Furthermore, FEC codes, network resource allocation and management is presented.

UDP and TCP (Transport Layer): The elements of transport protocols are covered in this section. This includes addressing and establishing or releasing a connection. Also, the concept of flow control is presented and the importance of buffering is stressed.

The concept of UDP and Transmission Control Protocol (TCP) is then presented along with their performance issues.

Local area networks; wired and wireless: LAN topologies, protocols and the IEEE 802 standards; LAN interconnection, bridges, hubs,

	<p>switches. Ethernet versions. Cellular systems: frequency reuse, capacity increase, operation. Wireless</p> <p>Virtual circuit and datagram networks; Router structure. Routing algorithms; link-state; distance-vector and hierarchical routing. Routing in the Internet (Intra-AS routing and Inter-AS routing: BGP). Broadcast and multicast routing. IPv6. Principles of congestion control; causes and the costs of congestion; approaches to congestion control; TCP congestion control.</p> <p>Domain Name System (DNS): For the application layer, the Domain Name System is presented in detail.</p> <p>Network security: Requirements; types of attacks; symmetric and asymmetric encryption techniques and their algorithms; Secure Socket Layer; IPv4 and IPv6 security; wireless protected access</p>										
Teaching Methodology	Face- to- face										
Bibliography	<p>W. Stallings, Computer Networking with Internet Protocols and Technology, Prentice Hall</p> <p>J.F. Kurose and K.W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Addison-Wesley</p> <p>Behrouz A. Forouzan Data Communications and Networking, 4/e, Mc Graw-Hill</p> <p>L.L. Peterson and B.S. Davie., COMPUTER NETWORKS, A SYSTEMS APPROACH, Morgan Kaufmann Publishers</p> <p>A S. Tanenbaum, Computer Networks, Prentice Hall</p>										
Assessment	<table border="0"> <tr> <td>Mid – Term Examination</td> <td style="border: 1px solid black; text-align: center;">20%</td> </tr> <tr> <td>Final Examination</td> <td style="border: 1px solid black; text-align: center;">40%</td> </tr> <tr> <td>Assignments/Lab</td> <td style="border: 1px solid black; text-align: center;">30%</td> </tr> <tr> <td>Class Participation and Attendance</td> <td style="border: 1px solid black; text-align: center;">10%</td> </tr> <tr> <td></td> <td style="border: 1px solid black; text-align: center;">100%</td> </tr> </table>	Mid – Term Examination	20%	Final Examination	40%	Assignments/Lab	30%	Class Participation and Attendance	10%		100%
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Language	English										