



LONDON CAPITAL COMPUTER COLLEGE

Advanced Diploma in Computer Science (907) – Data Communications & Networking

Prerequisites: Good computing knowledge	Corequisites: A pass or better in Diploma in System Analysis & Design or equivalence.
Aim: This course focuses on design and implementation of network programs and systems, including topics in network protocols, file transfer and client-server computing. The course explores trends in standardisation, internetworking, development of Wide Area Networks (WANs) and enterprise-wide networks. Other topics include OSI Model, transmission media, network operating systems, topologies, configuration protocols and performance characteristics.	
Required Materials: Recommended learning resources.	Supplementary Materials: Lecture notes and tutor extra reading recommendations.
Special Requirements: None	
Intended Learning Outcomes: 1 Define network models. Define how data is transformed into electromagnetic signals. Describe analogue and digital data. Understand how to represent digital data by using digital signals. Describe analogue transmission.	Assessment Criteria : 1.1 Demonstrate the difference between telecommunications and data communications. 1.2 Describe the difference between a protocol and a standard. 1.3 Familiarise with standards organisations and their duties. 1.4 Evaluate the duties of the layers in the OSI and Internet model. 1.5 Be able to compare the layers in the OSI and Internet model. 1.6 Explain the purpose of communications architectures. 1.7 Describe the OSI model, including a thorough discussion of each layer's function. 1.8 Illustrate the versatility of the OSI model by describing a file transfer between two computers as the data passes through the various layers. 1.9 Explain the concept of a network. 1.10 Explain how the public network functions. 1.11 Describe basic signalling functions. 1.12 Explain and compare parallel and serial transmission. 1.13 Explain and compare asynchronous and synchronous transmission. 1.14 Examine scenarios where the efficiency of asynchronous and synchronous transmission differs. 1.15 Explain and compare simplex, half duplex, and full-duplex communications.
2 Describe bandwidth utilisation. Define multiplexing and spreading. Describe the transmission medium and the classes of transmission media.	2.1 Describe the difference between digital and analog bandwidth. 2.2 Compare different transmission media, including twisted pair wire, coaxial cable, twinaxial cable, fiber optic cable,

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	<p>satellite transmission, and terrestrial microwave transmission.</p> <p>2.3 Compare baseband and broadband transmission.</p> <p>2.4 Discuss multiplexers and their applications.</p> <p>2.5 Explain time division multiplexing, and discuss its advantages and disadvantages.</p> <p>2.6 Describe statistical time division multiplexing, and present its advantages and disadvantages.</p> <p>2.7 Explain frequency division multiplexing, and discuss its advantages and disadvantages.</p> <p>2.8 Describe the use of data compression devices to improve communications efficiency.</p>
<p>3 Describe the classification of switched networks. Describe the operations of telephone and cable networks for data transmission.</p>	<p>3.1 Describe the increased competition in the industry.</p> <p>3.2 Compare different communications service offerings.</p> <p>3.3 Contrast leased and switched services.</p> <p>3.4 Explain the function and elements of packet switching networks.</p> <p>3.5 Describe the features of public packet switching networks.</p>
<p>4 Describe how data can be corrupted during transmission. Define the data framing process.</p>	<p>4.1 Describe how error control is handled at the data link layer.</p> <p>4.2 Demonstrate the addressing mechanism used in the data link layer and how network layer addresses are mapped to data link layer addresses.</p> <p>4.3 Describe different sources of data errors.</p> <p>4.4 Explain the echo checking error control method.</p> <p>4.5 Describe the different parity checking methods, including even parity, odd parity, space parity, mark parity, and no parity.</p> <p>4.6 Describe the cyclical redundancy check method of error detection, and explain why it is more reliable at detecting errors than a simple checksum.</p> <p>4.7 Discuss the importance of data security, and review common security concerns.</p> <p>4.8 Discuss the advantages of secure transmission facilities.</p> <p>4.9 Explain the use of passwords, and point out their limitations.</p>
<p>5 Describe Ethernet. Describe how wireless LANs operate. Describe the process of connecting LANs, backbone networks and virtual LANs.</p>	<p>5.1 Define the use of LANs in an organisation.</p> <p>5.2 Be familiar with the IEEE standards.</p> <p>5.3 Be familiar with traditional Ethernet technology and its implementations.</p> <p>5.4 Be familiar with Fast Ethernet technology and its implementations.</p> <p>5.5 Define the main characteristics of IEEE 802.11 wireless LANs.</p> <p>5.6 Define the applications of IEEE 802.11.</p> <p>5.7 Define the characteristics of IEEE</p>

<p>6 Describe the implementation of virtual-circuit networks. Define logical addressing. Describe how networks are internetworked together.</p>	<p>802.15 LANs and the Bluetooth technology that implements this standard.</p> <p>5.8 Explore the concept of virtual LANs.</p> <p>5.9 Describe the applications and rationale for VLANs.</p> <p>5.10 Explore the different transmission techniques used in wireless LANs.</p> <p>6.1 Investigate Frame-relay; ATM; ATM LANS.</p> <p>6.2 Describe IPv4 addresses.</p> <p>6.3 Describe Address mapping; internet control message protocol (ICMP); internet group management protocol (IGMP); packet delivery and forwarding; unicast routing protocols and multicast routing protocols.</p> <p>6.4 Explore the services provided by the telephone network and how these services allow us to connect to the Internet.</p> <p>6.6 Define how the Internet began.</p> <p>6.7 Describe the architecture of today's Internet and its relationship with ISPs.</p> <p>6.8 Explore the importance of the TCP/IP protocol suite.</p> <p>6.9 Define the role of IP, UDP, and TCP in the Internet.</p> <p>6.10 Describe the difference between the Internet, an intranet, and an extranet.</p> <p>6.11 Briefly introduce the T-1/E-1, ISDN, packet switching networks, frame relay networks, and the Internet as digital transmission options.</p>
<p>7 Describe how the delivery of a packet requires the logical and physical addressing. Describe how the network layer supervises the handling of packets by the underlying networks. Describe the process-to-process delivery.</p>	<p>7.1 Describe the position of the network layer in the Internet model.</p> <p>7.2 Define the rationale for the existence of the network layer.</p> <p>7.3 Describe the concept of host-to-host delivery.</p> <p>7.4 Analyse the duties of the network layer: packetising, addressing, routing.</p> <p>7.5 Describe the network-layer protocol, IP, used in the Internet.</p> <p>7.6 Outline which upper-layer protocol can use the services of IP.</p>
<p>8 Define congestion control and quality of service.</p>	<p>8.1 Discuss applications of high bandwidth transmission facilities, like T-1.</p> <p>8.2 Explain the elements of a T-1 frame.</p> <p>8.3 Introduce QoS issues and concerns.</p> <p>8.4 Define Data traffic</p> <p>8.5 Define congestion</p> <p>8.6 Describe congestion control mechanisms</p> <p>8.7 Describe quality of service (QoS), techniques to improve QoS and integrated and differentiated services.</p>
<p>9 Describe the hierarchy of a domain name space. Describe electronic mail and file transfer. Describe the architecture of World Wide Web</p>	<p>9.1 Describe the hierarchical domain name space</p> <p>9.2 Define distribution of name space</p>




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(WWW). Define how HyperText Transfer Protocol (HTTP) is used to access data on the WWW.	9.3 Describe DNS on the internet 9.4 Define name resolution. 9.5 Define remote logging, electronic mail and file transfer protocol (FTP) 9.6 Describe WWW and HTTP
10 Describe the functions performed by a network management system.	10.1 Describe the major network management functions. 10.2 Explain the concept of service levels in network management. 10.3 Explain the difference between throughput and transmission rate, and which is more meaningful to the end user.
11 Describe the components and categories of cryptography. Describe the services provided by network security. Describe security on the Internet. Define the structure of the security protocols.	11.1 Define how privacy can be achieved through encryption/decryption. 11.2 Define the digital signature concept and how it can be used to provide authentication, integrity, and non repudiation. 11.3 Describe firewalls and their use in isolating an organisation from intruders. 11.4 Be familiar with VPN technology and how it provides privacy. 11.5 Define the different access control methods. 11.6 Describe Symmetric-key and asymmetric-key cryptography, message confidentiality, message integrity, message authentication, digital signature, entity authentication, symmetric-key and public-key distribution. 11.7 Define IPSECURITY (IPSec), Secure Sockets Layer (SSL), Transport Layer Security (TLS), Pretty Good Privacy (PGP) and Firewall

Recommended Learning Resources: Data Communications and Networking

Text Books	<ul style="list-style-type: none"> Data and Computer Communications by William Stallings ISBN 10: 0131006819 Data Communications and Networking by Behrouz A. Forouzan ISBN 10: 0073250325
Study Manuals 	BCE produced study packs
CD ROM 	Power-point slides
Software 	None

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