



**Diploma in System Design (401) – Network Fundamentals**

<b>Prerequisites:</b> Basic knowledge of computing terminology.	<b>Corequisites:</b> A pass or better in Certificate in Computer Fundamentals or equivalence.
<b>Aim:</b> An introduction to networking that includes terminology, OSI model concepts, common protocol suites, network standards, and network topologies. Also included are peer-to-peer versus server-based networks, network topologies, media, interface cards, protocols and architectures. An in-depth coverage of the OSI model is essential.	
<b>Required Materials:</b> Recommended learning resources.	<b>Supplementary Materials:</b> Lecture notes and tutor extra reading recommendations.
<b>Special Requirements:</b> None	
<b>Intended Learning Outcomes:</b>	<b>Assessment Criteria:</b>
<p>1 Define the fundamental concepts of computer networks. Identify the constituent network components and various network types. Describe a reference model for network protocol architectures. Discuss the role of international standards and major standards organisations.</p> <p>2 Examine the physical layer of the OSI model. Identify the categorisation of networking equipment, and discuss transmission-related issues, including various transmission media.</p> <p>3 Examine the data link layer of the OSI model. Identify various link protocol types, and describe the constituent functions of link protocols, such as acknowledgment of frames, error checking, and flow control.</p> <p>4 Describe the network layer of the OSI model. Discuss the use of network primitives for defining network services. Identify switching</p>	<p>1.1 Describe the general characteristics of a computer network</p> <p>1.2 Understand the role of the major components of a computer network</p> <p>1.3 Distinguish between different network types and understand their properties</p> <p>1.4 Appreciate the relevance and importance of standards, in general, and the OSI model</p> <p>1.5 Describe the role and functions of each of the OSI layers.</p> <p>2.1 Distinguish between different network equipment types and understand their roles</p> <p>2.2 Distinguish between different device connection types</p> <p>2.3 Describe how data is transmitted and the basic techniques that this process involves</p> <p>2.4 Analyse the different physical transmission media and their characteristics</p> <p>2.5 Define the basic multiplexing methods and their role in data transmission.</p> <p>3.1 Distinguish between different data link protocol types and know the characteristics of each type</p> <p>3.2 Describe the various data link protocol functions.</p> <p>3.3 Explain how the CRC error checking method works and how a CRC code is calculated</p> <p>3.4 Analyse the sliding window protocol and explain how it can be used for flow control.</p> <p>4.1 Describe the nature of network services and use network primitives to describe network service scenarios;</p>

methods and their use for routing. Describe data packets and their handling by the network layer.	4.2 Describe how circuit switching works and appreciate its strengths and weaknesses
	4.3 Describe how packet switching works and distinguish between the virtual circuit and datagram methods and their packet formats
	4.4 Describe the basic routing algorithms (flooding, static routing, and dynamic routing) and their characteristics;
	4.5 Discuss the importance of congestion control; identify the need for internetworking and the sublayers provided to support it.
5 Describe the transport layer of the OSI model. Describe the transport protocol and related issues, such as segmentation, multiplexing, addressing, error control, and flow control. Discuss TCP.	5.1 Describe how the transport layer operates
	5.2 Describe the difference between the network and transport layer
	5.3 Describe the transport protocols
	5.4 Define segmentation, multiplex, addressing, error and flow control
6 Describe the session layer of the OSI model.	6.1 Define how the session layer operates
	6.2 Describe the session protocol
	6.3 Describe dialog units, synchronisation, error handling and the structure of session messages
	6.4 Define how a session is negotiated between two applications, the synchronisation and control of message exchanges between applications.
7 Describe the role of the presentation layer. Identify the notion of abstract data syntax, and then describe presentation service primitives and functional units.	7.1 Describe the different applications of data
	7.2 Describe the protocols found at the presentation layer
8 Define the application layer standards.	8.1 Analyse virtual terminal handling, message handling, file transfer and job transfer
	8.2 Discuss application services
	8.3 Explain some of the relevant terminology
	8.4 Describe groups of application service elements.
9 Illustrate the main characteristics of LANs.	9.1 Define the LAN concepts
	9.2 Discuss widely-adopted LAN standards
	9.3 Define WAN protocols
10 Examine the various components of telephone networks and the signaling technology which helps operate them. Define the difference between data networks and telephone networks.	10.1 Define circuit switching packet switching and signaling.
	10.2 Identify the common channel signaling and its standards.
	10.3 Examine private telephone networks and their relevance to public networks
11 Define Integrated Services Digital Network (ISDN). Describe the ISDN technology. Define ISDN concepts, including its channels, reference points, functional groupings, and	11.1 Describe the ISDN protocol architecture in relation to the OSI model;
	11.2 Discuss various ISDN standards;
	11.3 Examine the potential future of ISDN




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services.	within the context of global communication networks.
12 Describe Broadband ISDN (B-ISDN) and the transfer mode designed for its implementation; Asynchronous Transfer Mode (ATM).	12.1 Describe the basic concepts underlying ATM protocol architecture; 12.2 Discuss the organisation of ATM networks and their potential applications.

### **Recommended Learning Resources: Networking Fundamentals**

<b>Text Books</b>	<ul style="list-style-type: none"> <li>• Networking Fundamentals (Hardcover) by Richard M. Roberts. ISBN-10: 1590704495</li> <li>• Hands-On Networking Fundamentals (Paperback) by Michael Palmer. ISBN-10: 1418835544</li> <li>• Networking Foundations: Technology Fundamentals for IT Success (Paperback) by Patrick Ciccarelli and Christina Faulkner. ISBN-10: 0782143717</li> <li>• Understanding Data Communications: From Fundamentals to Networking, 3rd Edition (Hardcover) by Gilbert Held. ISBN-10: 0471627453</li> </ul>
<b>Study Manuals</b> 	BCE produced study packs
<b>CD ROM</b> 	Power-point slides
<b>Software</b> 	None