



## Diploma in System Design (401) 135 Credits



<b>Unit:</b> Network Fundamentals	<b>Guided Learning Hours:</b> 240
<b>Exam Paper No.:</b> 3	<b>Number of Credits:</b> 24
<b>Prerequisites:</b> Basic knowledge of computing terminology.	<b>Corequisites:</b> A pass or better in Certificate in Computer Fundamentals or equivalence.
<p><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. Networks rely on a number of devices, models and rules to communicate; hence learner have to understand both TCP/IP and OSI models. Theoretical concepts will be reinforced through the basic configuration and management of typical network devices. To increase learner efficiency, LANs (Local Area Networks) and WANs (Wide Area Networks) are covered; including their use in interconnecting computers, supporting devices to enable data and resources to be shared.</p>	
<b>Required Materials:</b> Recommended learning resurces.	<b>Supplementary Materials:</b> Lecture notes and tutor extra reading recommendations.
<p><b>Special Requirements:</b> The unit requires a combination of lectures, demonstrations and class discussions.</p>	
<p><b>Intended Learning Outcomes:</b></p> <p>1 The fundamental concepts of computer networks a reference model for network protocol architectures, the role of international standards and major standards organisations.</p> <p>2 The physical layer of the OSI model; the categorisation of networking equipment, and transmission-related issues, including various transmission media.</p> <p>3 The data link layer of the OSI model; various link protocol types; the constituent functions of link protocols, such as acknowledgment of frames, error checking, and flow control.</p>	<p><b>Assessment Criteria:</b></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 Explain 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</p>

<p>4 Data packets; their handling by the network layer of the OSI model; the use of network primitives for defining network services; switching methods and their use for routing.</p>	<p>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> <p>4.2 Describe how circuit switching works and analyse its strengths and weaknesses</p> <p>4.3 Describe how packet switching works</p> <p>4.4 Distinguish between the virtual circuit and datagram methods and their packet formats</p> <p>4.5 Describe the basic routing algorithms (flooding, static routing, and dynamic routing) and their characteristics;</p> <p>4.6 Explain the importance of congestion control; identify the need for internetworking and the sublayers provided to support it.</p>
<p>5 The transport layer of the OSI model; the transport protocol; related issues, such as segmentation, multiplexing, addressing, error control, TCP, and flow control.</p>	<p>5.1 Describe how the transport layer operates</p> <p>5.2 Describe the difference between the network and transport layer</p> <p>5.3 Describe the transport protocols</p> <p>5.4 Define segmentation, multiplex, addressing, error and flow control</p>
<p>6 Understand how connections are established, managed, and torn down; analysing common APIs and functions of the Session Layer.</p>	<p>6.1 Define how the session layer operates</p> <p>6.2 Describe the session protocol</p> <p>6.3 Describe dialog units, synchronisation, error handling and the structure of session messages</p> <p>6.4 Define how a session is negotiated between two applications, the synchronisation and control of message exchanges between applications.</p>
<p>7 Understand the role of the presentation layer; the notion of abstract data syntax, and presentation service primitives and functional units.</p>	<p>7.1 Describe the different applications of data</p> <p>7.2 Describe the protocols found at the presentation layer</p> <p>7.3 Outline the presentation layer</p> <p>7.4 Describe the responsibilities and components of the presentation layer</p> <p>7.5 Explain how data disconnected and streaming applications in the presentation layer.</p> <p>7.6 Describe data validation in the presentation layer</p> <p>7.7 Describe the pros and cons of storing per-user session data</p>
<p>8 The application layer standards and protocols, why they are needed and their functions.</p>	<p>8.1 Explain virtual terminal handling, message handling, file transfer and job transfer</p> <p>8.2 Discuss application services</p> <p>8.3 Explain some of the relevant terminology</p> <p>8.4 Describe groups of application service</p>

<p>9 LAN topologies; the main characteristics of each topology; the various components of telephone networks; the signaling technology which helps operate them and the difference between data networks and telephone networks.</p>	<p>elements</p> <p>9.1 Define the LAN concepts</p> <p>9.2 Discuss widely-adopted LAN standards</p> <p>9.3 Define WAN protocols</p> <p>9.4 Define circuit switching packet switching and signaling.</p> <p>9.5 Identify the common channel signaling and its standards.</p> <p>9.6 Examine private telephone networks and their relevance to public networks</p> <p>9.7 Describe the ISDN protocol architecture in relation to the OSI model</p> <p>9.8 Discuss various ISDN standards</p> <p>9.9 Examine the potential future of ISDN within the context of global communication networks.</p> <p>9.10 Describe the basic concepts underlying ATM protocol architecture;</p> <p>9.11 Discuss the organisation of ATM networks and their potential applications.</p> <p>9.12 Analyse the future of ISDN with presence of today's broadband technology.</p>
<p><b>Methods of Evaluation:</b> A 2½-hour essay written examination paper with 5 questions, each carrying 20 marks. Candidates are required to answer all questions. Candidates also undertake project/coursework in Networking Fundamentals with a weighting of 100%.</p>	

### Recommended Learning Resources: Networking Fundamentals

<p><b>Text Books</b></p>	<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 Cicarelli 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>
<p><b>Study Manuals</b></p> 	<p>BCE produced study packs</p>
<p><b>CD ROM</b></p> 	<p>Power-point slides</p>
<p><b>Software</b></p> 	<p>None</p>