Network Engineering 1A
NWEG5111
MODULE OUTLINE 2022
(First Edition: 2018)

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Table of Contents

Introduction

In this module you will cover basic theoretical concepts of network architecture, which includes topologies, protocols, media and network standards and models. The theoretical knowledge and practical experience in configuration and the troubleshooting of local area networks provide a foundation for all areas of Information and Communications Technology.

Using this Module Outline

This module outline has been developed to support your learning. Please note that the content of this module is on Learn as well as in the prescribed material. You will not succeed in this module if you focus on this document alone.

- This document does not reflect all the content on Learn, the links to difference resources, nor the specific instructions for the group and individual activities.
- Your lecturer will decide when activities are available/open for submission and when these submissions or contributions are due. Ensure that you take note of announcements made during lectures and/or posted within Learn in this regard.

This Module on Learn

Learn is an online space, designed to support and maximise your learning in an active manner. Its main purpose is to guide and pace you through the module. In addition to the information provided in this document, you will find the following when you access Learn:

- A list of prescribed material;
- A variety of additional online resources (articles, videos, audio, interactive graphics, etc.) in each learning unit that will further help to explain theoretical concepts;
- Critical questions to guide you through the module's objectives;
- Collaborative and individual activities (all of which are gradable) with time-on-task estimates to assist you in managing your time around these;
- Revision questions, or references to revision questions, after each learning unit.

Kindly note:

- Unless you are completing this as a distance module, Learn does not replace your contact time with your lecturers and/or tutors.
- NWEG5111 is a Learn module, and as such, you are required to engage extensively with the content on the Learn platform. Effective use of this tool will provide you with opportunities to discuss, debate, and consolidate your understanding of the content presented in this module.
- You are expected to work through the learning units on Learn in your own time – especially before class. Any contact sessions will therefore be used to raise and address any questions or interesting points with your lecturer, and not to cover every aspect of this module.
- Your lecturer will communicate submission dates for specific activities in class and/or on Learn.

Icons Used in this Document and on Learn

The following icons are used in all your modules on Learn:

Icon	Description
	A list of what you should be able to do after working through the learning unit.
	Specific references to sections in the prescribed work.
	Questions to help you recognise or think about theoretical concepts to be covered.
	Sections where you get to grapple with the content/ theory. This is mainly presented in the form of questions which focus your attention and are aimed at helping you to understand the content better. You will be presented with online resources to work through (in addition to the textbook or manual references) and find some of the answers to the questions posed.
	Opportunities to make connections between different chunks of theory in the module or to real life.
	Real life or world of work information or examples of application of theory, using online resources for self-exploration.

REMEMBER:

You need to log onto Learn to:

- Access online resources such as articles, interactive graphics, explanations, video clips, etc. which will assist you in mastering the content; and
- View instructions and submit or post your contributions to individual or group activities which are managed and tracked on Learn.

Module Resources	
Prescribed Material (PM) for this Module	White C.M. Data Communications & Computer Networks: A Business User's Approach. 8th Edition. 2016. Cengage Learning: Boston ISBN: 978-1-305-11663-1
Recommended Readings, Digital, and Web Resources	Please note that a number of additional resources and links to resources are provided throughout this module on the Learn platform. You are encouraged to engage with these as they will assist you in mastering the various objectives of this module. They may also be useful resources for completing any assignments. You will not, however, be assessed under examination conditions on any additional or recommended reading material.
Module Overview	You will find an overview of this module on Learn under the *Module Information* link in the Course Menu.
Assessments	Find more information on this module's assessments in this document and on the Student Portal.

Module Purpose

The purpose of this module is to develop students' understanding of the basic theoretical concepts of network architecture which include topologies, protocols, media and network standards and models. Students gain practical experience in configuration and troubleshooting local area networks.

Module Outcomes

MO1	Demonstrate an understanding of the basic structure and architecture of networks including network media, protocols and topologies in Local Area Networks.
MO2	Install, configuration and test Local Area Networks.
MO3	Demonstrate knowledge of different components and tools of networks including their purpose, features and functions of Local Area Networks.
MO4	Troubleshoot networks.

Assessments

Integrated Curriculum Engagement (ICE)	
Minimum number of ICE activities to complete	4
Weighting towards the final module mark	10%

Assignments/Projects	Assignment
Weighting	25%
Duration	10 hours
Submit after	LU6
Learning Units covered	LU1 – LU6
Resources required	Internet Search Engine, Hyper-V, Windows Client and Windows Server iso files and Microsoft Visio

Tests/Examination	Take-Home Test	Take-Home Examination
Weighting	30%	35%
Duration	1 hour	2 hours
Total marks	60 marks	120 marks
Learning Units covered	LU1 – LU5	ALL

Assessment Preparation Guidelines		
	Format of the Assessment *(The Focus/ Approach/ Objectives)*	Preparation Hints *(How to Prepare, Resources to Use, etc.)*
Assignment	Refer to the assignment for this information.	Refer to the assignment for this information.
Take-Home Test	The test for this module will assess your understanding of Learning Unit 1 to 5 of this module and will include a series of short and medium-length questions, as well as one long question. You will be expected to apply, as well as recall information as per your objectives for these learning units.	• Ensure that you work through all the relevant activities, exercises and revision questions on Learn and in your textbook. • Brainstorm possible questions based on the learning outcomes and objectives provided. Then complete these as practise tests. • During both, your preparation for the test and during the test itself, pay attention to the instruction words (like list, apply, describe, etc.) and to the mark allocations of each question to ensure that you are able to provide the correct depth and detail in your answers. • Make sure that you have mastered the objectives in Learning Units 1 to 5.
Take-Home Exam	The examination will assess all learning units in this module and will include both theory and application-type questions. You will be expected to respond to short, theory-based questions, as well as to three literary analysis essay-type questions).	• Consult your examination brief for this module, which will be made available prior to your examination. Make sure that you practise answering the sample questions in the brief so that you become familiar with the kinds of

		questions likely to appear in the examination itself. • Ensure that you work through all the activities, exercises and revision questions on Learn and in your textbook. You must have completed close readings of your prescribed material to ensure that you have prepared adequately for your examination for this module. • Pay close attention to the instruction words (like list, apply, describe, analyse, etc.) and to the mark allocations of each question to ensure that you provide the correct depth and detail in your answers. • Make sure that you are comfortable in responding to all the objectives for all learning units. Brainstorm possible questions based on the learning outcomes and objectives provided.

Module Pacer			
Code	Programme	Sessions	Credits
NWEG5111	BCAD1; BCNE1	Contact: 24 Learn: 5	15
Learning Unit 1	Introduction to Computer Networks, Data Communication and Network Engineering		

Overview:

Computer networks and data communication is a vast field of study. Previously, only network engineers and technicians were involved with networks, nowadays from the business manager of the company to the system engineer, the house owner and/or the gamer, are all involved with computer networks in one way or another. Computer networks have become part of our everyday lives.

In this learning unit, you will learn about basic computer network concepts and models. Not only will a solid understanding of these concepts and models assist you in developing an understanding of the functions and roles of each layer within the models, but they will also improve your knowledge of computer networking in general. A good understanding of the relationship between TCP/IP and the computer network model layers is also important to assist you with network design.

If you are a contact student, you will likely spend 4 sessions on this learning unit.

Please work through Themes 1, 2 and 3 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please also ensure that you complete the following activities on Learn:

Activity		*Estimated Time on Task*
1.1.1	Types of networks	90 minutes
1.2.1	Communications Networks	120 minutes
1.3.1	TCP/IP Protocol and OSI Models	120 minutes
Estimated total time for this learning unit's activities		*5 hours 30 minutes*

<table>
<tr><th colspan="3">Learning Unit 1: Theme Breakdown</th></tr>
<tr><td>Sessions:
1-4</td><td>Theme 1: Computer Networks</td><td>Prescribed Material (PM)</td></tr>
<tr><td>Academic Week:
1</td><td rowspan="2">LO1: Define the basic terminology of computer networks;
LO2: Explain the components of computer networks;
LO3: Explain how the reasons for a network architecture apply to the current network system;
LO4: Discuss the reasons for using a network model.</td><td rowspan="2">PM1: Chapter 1</td></tr>
<tr><td rowspan="5">Related Outcomes:
MO001
MO003</td></tr>
<tr><td>Theme 2: Overview of Data Communications</td><td rowspan="2">PM2: Chapter 1</td></tr>
<tr><td>LO5: Explain what data communication is and describe the types of communication systems;
LO6: Explain the fundamental characteristics of an effective data communication system;
LO7: Outline the components of a communication system in the context of computer networks.</td></tr>
<tr><td>Theme 3: TCP/IP and OSI Model</td><td rowspan="2">PM1: Chapter 1</td></tr>
<tr><td>LO8: Describe the role and functions of the layers of the TCP/IP protocol suite;
LO9: Describe the role and functions of the layers of the OSI model;
LO10: Compare the OSI and TCP/IP models.</td></tr>
</table>

Learning Unit 2	Fundamentals of Data and Signals

Overview:

This learning unit starts with an overview of the different types of signals, components and the advantages or disadvantages of these signals and components. Various transmission processes and encoding techniques such as shift keying techniques are addressed next. We also look at digitisation techniques and their advantages and disadvantages and conclude with a discussion of data codes and how they are used in communication systems.

If you are a contact student, you will likely spend 4 sessions on this learning unit.

Please work through Themes 1, 2, and 3 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the following activities on Learn:

Activity		*Estimated Time on Task*
2.1.1	Data Transmission	90 minutes
2.2.1	Digitisation techniques	60 minutes
2.3.1	Transmitting Digital Data	60 minutes
Estimated total time for this learning unit's activities		*3 hours 30 minutes*

<table>
<tr><th colspan="3">Learning Unit 2: Theme Breakdown</th></tr>
<tr><td>Sessions:
5-8</td><td>Theme 1: Data and Signals</td><td>Prescribed Material (PM)</td></tr>
<tr><td>Academic Week:
2</td><td>LO1: Distinguish between data and signals;
LO2: Explain the advantages of digital data and signals over analog data and signals;
LO3: Describe the basic components of a signal as amplitude, frequency, and phase;
LO4: Discuss the bandwidth of a signal and how it relates to data transfer speed.</td><td>PM: Chapter 2</td></tr>
<tr><td rowspan="3">Related Outcomes:
MO001
MO003
MO004</td><td>Theme 2: Converting Data into Signals</td><td rowspan="2">PM: Chapter 2</td></tr>
<tr><td>LO5: Describe the characteristics of transmitting:
• digital data with digital signals
• analog data with digital signals
• digital data with analog signals
• analog data with analog signals

LO6: Compare the characteristics, uses, advantages, and disadvantages, of the different shift keying techniques;
LO7: Compare different digitisation techniques namely pulse code modulation and delta modulation, and their advantages and disadvantages.</td></tr>
<tr><td>Theme 3: Data Codes</td><td rowspan="2">PM: Chapter 2</td></tr>
<tr><td>LO8: Distinguish between the different data codes and how they are used in communication systems.</td></tr>
</table>

Learning Unit 3	Network Media

Overview:

There is a number of different types of network media available, each with its own advantages and disadvantages. In this learning unit, we explore the types of network media, what each of them is used for and the types of wire for each of them. We also look at satellite microwave systems and the different earth orbit satellites. This is followed by an investigation into cellular telephones and current generations of cellular systems, short range transmissions and broadband wireless systems. The learning unit concludes with the media selection criteria for conducted media.

If you are a contact student, you will likely spend 4 sessions on this learning unit.

Please work through Themes 1, 2, 3, and 4 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the following activities on Learn:

Activity		*Estimated Time on Task*
3.2.1	Conducted media	150 minutes
3.3.1	The use and benefits of satellites	60 minutes
3.3.2	Communications Networks Recommendations	120 minutes
3.4.1	Apply the media selection criteria	120 minutes
Estimated total time for this learning unit's activities		*7 hours 30 minutes*

Learning Unit 3: Theme Breakdown		
Sessions: 9-12	Theme 1: Categories of Network Media	Prescribed Material (PM)
Academic Week: 3	LO1: Explain the characteristics of different types of network media; LO2: Discuss the use of different types of network media; LO3: Explain the advantages and disadvantages of different types of network media.	PM: Chapter 3
Related Outcomes: MO001 MO003 MO004	Theme 2: Conducted Media	PM: Chapter 3
	LO4: Identify the type of wire for each different type of network media.	
	Theme 3: Wireless Media	PM: Chapter 3
	LO5: Explain the characteristics of satellite microwave systems including the advantages and disadvantages; LO6: Describe the differences between low earth orbit, middle earth orbit, and geosynchronous earth orbit satellites; LO7: Describe the basics of cellular telephones using the current generations of cellular systems; LO8: Explain the characteristics of short range transmissions; LO9: Explain the characteristics of broadband wireless systems including the advantages and disadvantages.	
	Theme 4: Media Selection Criteria	PM: Chapter 3
	LO10: Apply the media selection criteria for conducted media.	

Learning Unit 4	Network Connections and Connectivity

Overview:

This learning unit focusses on network connection and connectivity. We will take a closer look at the components and the basic operations of interface standards and will investigate the characteristics of different types of data link interfaces. We will also look at the different types of link connections and multiplexing, including basic multiplexing characteristics of connection systems. You will learn more about compression schemes and the basic operation of compression for different formats.

If you are a contact student, you will likely spend 5 sessions on this learning unit.

Please work through Themes 1, 2, and 3 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the following activities on Learn:

Activity		*Estimated Time on Task*
4.1.1	USB Peripherals	90 minutes
4.1.2	Synchronous, asynchronous and isochronous data link protocol	90 minutes
4.2.1	Applying multiplexing techniques	150 minutes
Estimated total time for this learning unit's activities		*5 hours 30 minutes*

Learning Unit 4: Theme Breakdown		
Sessions: 13-17	Theme 1: Network Connections	Prescribed Material (PM)
Academic Week: 4-5	LO1: Define basic concepts of network connection; LO2: Explain what interfacing a computer to peripheral devices is using examples; LO3: Explain the components and the basic operations of interface standards; LO4: Explain the characteristics of different types of data link interfaces; LO5: Discuss the different types of link connections.	PM: Chapter 4
Related Outcomes: MO001 MO002 MO003 MO004	Theme 2: Multiplexing LO6: Define basic concepts of multiplexing; LO7: Describe different types of multiplexing and explain their applications; LO8: Explain the advantages and disadvantages of different types of multiplexing; LO9: Explain the basic multiplexing characteristics of different types of connection systems; LO10: Apply a multiplexing technique to an example business situation.	PM: Chapter 5
	Theme 3: Compression LO11: Define basic concepts of compression; LO12: Compare lossy and lossless and lossless compression schemes; LO13: Describe the basic operation of compression for different types of formats.	PM: Chapter 5

Learning Unit 5	Local Area Networks

Overview:

In this learning unit, you will learn more about wired Local Area Networks (LAN). We will look at the advantages and disadvantages of LAN and the application areas thereof after which we will compare logical LANs to physical LANs. You will learn more about access control in a wired LAN and wireless LAN respectively as well as wired and wireless Ethernet frame formats. You will also find out how to install setup and configure wired and wireless LANs.

Because all networks need network operating systems to operate, we will explore how they operate, the role these systems play in networking and what their basic features are. We will identify the basic features of operating systems and find out how to install, configure and maintain them for a LAN in particular. Knowledge of networks and network operating systems is incomplete without a sound understanding of the different types and models of network servers. In this learning unit, you will learn more about network servers and how to install, configure, manage, maintain and troubleshoot them.

Finally, we will explore the functions and benefits of network utility and Internet software respectively. Included in this discussion, is software licensing. You will find out more about RAID and RAID levels, the different types of support devices on LANs and lastly, how to install, configure and maintain network software and utilities on a LAN.

If you are a contact student, you will likely spend 5 sessions on this learning unit.

Please work through Themes 1, 2, 3, 4, and 5 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the following activities on Learn:

Activity		*Estimated Time on Task*
5.1.1	LAN systems; devices, infrastructure, installation, setup and configuration	150 minutes
5.2.1	Wireless LAN standards	60 minutes
5.3.1	Network Operating Systems	120 minutes
5.4.1	RAID and RAID Techniques	150 minutes
5.5.1	Software Licensing Agreements	60 minutes
Estimated total time for this learning unit's activities		*9 hours*

Learning Unit 5: Theme Breakdown		
Sessions: 18-22	Theme 1: Wired Local Area Networks	Prescribed Material (PM)
Academic Week: 6-7	LO1: Discuss the function, activities, and application areas of a Local Area Network (LAN); LO2: Define basic concepts of wired LANs; LO3: Explain the advantages and disadvantages of LANs; LO4: Compare the physical LAN to a logical LAN; LO5: Explain the different medium access control in a given wired LAN scenario; LO6: Describe wired Ethernet frame formats; LO7: Discuss wired LAN systems, devices and infrastructure; LO8: Install, set up and configure wired LANs.	PM: Chapter 7
Related Outcomes: MO001 MO002 MO003 MO004	Theme 2: Wireless Local Area Networks LO9: Define basic concepts of wireless Local Area Networks (LAN); LO10: Explain the different medium access control in a given wireless LAN scenario; LO11: Describe wireless Ethernet frame formats; LO12: Describe the components of a wireless LAN; LU13: Install, set up and configure wireless LANs.	PM: Chapter 8
	Theme 3: Network Operating Systems LO14: Distinguish between operating systems and network operating systems; LO15: Explain the main functions of operating systems and network operating systems; LO16: Identify basic features of operating systems.	PM: Chapter 8

	Theme 4: Network Servers LO17: Install, configure and maintain operating systems for a LAN; LO18: Discuss the importance of the network server; LO19: Explain the different types of network servers and models; LO20: Identify a suitable network server solution for an organisation; LO21: Install, configure, manage, maintain and troubleshoot a network server.	PM: Chapter 8
	Theme 5: Network Support Software LO22: Identify common examples of network utility software and Internet software; LO23: Explain the functions and benefits of network utility software and Internet software for an organisation; LO24: Evaluate various components of software licenses; LO25: Discuss the importance of RAID; LO26: Describe the RAID levels using a business scenario; LO27: Explain the different types of support devices found on LANs; LO28: Install, configure and maintain network software and utilities for a LAN.	PM: Chapter 8

Learning Unit 6	Introduction to Metropolitan Area Networks and Wide Area Networks

Overview:

A network that expands beyond a metropolitan area, is called a wide area network. Wide area networks share a few characteristics with local area networks: they interconnect computers, they use some form of media for the interconnection, and they support network applications. More importantly, however, wide area networks differ from local area networks in a number of ways. Wide area networks include both data networks, such as the Internet, and voice networks, such as telephone systems, whereas local area networks in almost all cases include only data networks. Wide area networks can interconnect thousands, tens of thousands, or more workstations so that any one workstation can transfer data to any other workstation. As the name implies, wide area networks can cover large geographic distances, including the entire earth.

If you are a contact student, you will likely spend 5 sessions on this learning unit.

Please work through Themes 1, 2, and 3 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the following activities on Learn:

Activity		*Estimated Time on Task*
6.1.1	WAN and MAN Comparison	120 minutes
6.2.1	WAN and MAN traffic Routing and Congestion	120 minutes
6.3.1	Internet applications and services	60 minutes
Estimated total time for this learning unit's activities		*5 hours*

Learning Unit 6: Theme Breakdown		
Sessions: 23 - 27	Theme 1: MAN and WAN Basics	Prescribed Material (PM)
Academic Week: 8 - 9	LO1: Distinguish local area networks, metropolitan area networks, and wide area networks from each other; LO2: Identify the characteristics of metropolitan area networks; LO3: Explain how metropolitan area networks compare and contrast with wide area and local area networks; LO4: Describe how circuit switched, datagram packet switched, and virtual circuit packet switched networks work; LO5: Identify the differences between a connectionless network and a connection-oriented network and give an example of each.	PM: Chapter 9
Related Outcomes: MO001 MO002 MO003 MO004	Theme 2: Routing and Network Congestion LO6: Describe the differences between centralised routing and distributed routing, citing the advantages and disadvantages of each; LO7: Describe the differences between static routing and adaptive routing, citing the advantages and disadvantages of each; LO8: Document the main characteristics of flooding; LO9: Use hop count and hop limit in a simple example; LO10: Discuss the basic concepts of network congestion including quality of service.	PM: Chapter 9

	Theme 3: The Internet LO11: Discuss the responsibilities of the Internet Protocol (IP); LO12: Discuss how IP can be used to create a connection between networks; LO13: Discuss the responsibilities of the Transmission Control Protocol (TCP); LO14: Discuss how TCP can be used to create a reliable end-to-end network connection; LO15: Identify both IPv4 addresses and IPv6 addresses; LO16: Identify the relationships between TCP/IP and the protocols ICMP, UDP, ARP, DHCP, NAT, and tunnelling protocols; LO17: Describe the responsibility of the Domain Name Service; LO18: Describe how the DNS converts a URL into a dotted-decimal IP address; LO19: Describe the major Internet applications and services; LO20: Discuss the business advantages of the World Wide Web; LO21: Recognise that the Internet is constantly evolving and that IPv6 and Internet demonstrate that evolution.	PM: Chapter 10

Learning Unit 7	Voice and Data Delivery Networks

Overview:

Voice and data delivery networks are the biggest networks in use today. Exchange carriers grew over the years as technology advanced. In this learning unit, we will investigate different exchange carriers. We will look at the different ways in which they connect to the Internet, the characteristics of these methods as well as the peripherals needed in each instance. Asynchronous transfer mode (ATM) is important in delivery on networks and you will look into the impact that MPLS and Metro Ethernet have on frame relay and ATM services.

If you are a contact student, you will likely spend 5 sessions on this learning unit.

Please work through Themes 1, 2, 3, and 4 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the following activities on Learn:

Activity		*Estimated Time on Task*
7.1.1	Compare Telephone Systems in South Africa	120 minutes
7.2.1	DSL vs cable model	150 minutes
7.3.1	Telecommunication services for voice and data delivery	90 minutes
7.4.1	Frame Relays and ATM services	120 minutes
Estimated total time for this learning unit's activities		*8 hours*

Learning Unit 7: Theme Breakdown		
Sessions: 28 - 32	Theme 1: The Basic Telephone System	Prescribed Material (PM)
Academic Week: 10	LO1: Identify the basic elements of a telephone system; LO2: Describe the difference between a local exchange carrier and an interexchange carrier; LO3: Describe the basic characteristics of a dial-up Internet connection; LO4: Describe the types of leased lines that are available and their basic characteristics.	PM: Chapter 11
Related Outcomes: MO001 MO003 MO004	Theme 2: Digital Subscriber Line	PM: Chapter 11
	LO5: Explain the main characteristics of digital subscriber line; LO6: Describe the difference between a symmetric system and an asymmetric system; LO7: Explain the main characteristics of a cable modem.	
	Theme 3: T-1 Leased Line Service and Frame Relay	PM: Chapter 11
	LO8: Explain the basic characteristics of frame relay.	
	Theme 4: Asynchronous Transfer Mode and Convergence	PM: Chapter 11
	LO9: Discuss the main characteristics of an asynchronous transfer mode; LO10: Describe the advantages and disadvantages of ATMs; LO11: Describe the concept of convergence, and identify several examples of it in the networking industry; LO12: Identify the impact that MPLS and Metro Ethernet have on frame relay and ATM services.	

Learning Unit 8	Network Security

Overview:

System attacks or attempts at system attacks are regular occurrences in the computer and data communication world. Numerous attempts are made to hack into systems to acquire the information in the system illegally. Companies and organisations need to be aware of the different forms of attacks and the precautions that can be taken to prevent such attacks.

In this learning unit, you will learn more about the different forms of attacks, precautions that can be taken, methods that can be used and techniques that can assist in securing data and systems.

If you are a contact student, you will likely spend 5 sessions on this learning unit.

Please work through Themes 1, 2, 3, and 4 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the following activities on Learn:

Activity		*Estimated Time on Task*
8.1.1	System attack challenges	150 minutes
8.2.1	Password selection for physical protection	60 minutes
8.3.1	Untrusted Communication Channels	120 minutes
Estimated total time for this learning unit's activities		*5 hours 30 minutes*

Learning Unit 8: Theme Breakdown		
Sessions: **33 - 37**	**Theme 1: Common System Attacks**	**Prescribed Material (PM)**
Academic Week: **11**	LO1: Explain the different forms of system attacks;	PM: Chapter 12
Related Outcomes: MO001 MO002 MO003 MO004	**Theme 2: Physical Protection and Controlling Access**	PM: Chapter 12
	LO2: Discuss the concepts underlying physical protection measures; LO3: Apply techniques used to control access to computers and networks; LO4: Cite the techniques used to make data secure.	
	Theme 3: Network Operating Systems	PM: Chapter 12
	LO5: Explain the difference between a substitution-based cipher and a transposition-based cipher; LO6: Outline the basic features of different types of cryptography.	
	Theme 4: Securing Communications and Security Policy Design Issues	PM: Chapter 12
	LO7: Apply techniques used to secure communications; LO8: Discuss the importance of a firewall; LO9: Apply the techniques used to secure wireless communications; LO10: Discuss the benefits to a business of having a security policy.	

Learning Unit 9	Design and Management of Networks

Overview:

Computer Networks and associated peripherals form part of a bigger system in a company or organisation. It is therefore very important for you to understand how the Systems development life cycle (SDLC) fits in with computer networks.

In this learning unit, you will look at the SDLC and all the phases involved and how it plays a role in systems development. You will also spend time on capacity planning and baseline studies. It is also important for you to understand the role of the help desk in the management of networks and therefore you will be spending time on the different systems available to assist you in monitoring networks.

If you are a contact student, you will likely spend 4 sessions on this learning unit.

Please work through Themes 1, 2, 3, and 4 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the following activities on Learn:

Activity		*Estimated Time on Task*
9.1.1	The Systems Development Life Cycle	90 minutes
9.2.1	Feasibility studies, Baseline Studies and Capacity Study	120 minutes
Estimated total time for this learning unit's activities		*3 hours 30 minutes*

Learning Unit 9: Theme Breakdown		
Sessions: 38 - 41	Theme 1: Systems Development Life Cycle and Network Modelling	Prescribed Material (PM)
Academic Week: 12	LO1: Recognise the systems development life cycle; LO2: Define each of the phases in the systems development life cycle; LO3: Explain the importance of creating location connectivity diagrams.	PM: Chapter 13
Related Outcomes: MO001 MO002 MO003 MO004	Theme 2: Creating a Baseline, Feasibility studies and Capacity planning	PM: Chapter 13
	LO4: Describe the differences between technical, financial, operational, and time feasibility; LO5: Explain why performing capacity planning and traffic analysis is difficult; LO6: Describe the steps involved in performing a baseline study; LO7: Create a cost-benefit analysis incorporating the time value of money.	
	Theme 3: Network Manager Skills and Generating Useable Statistics	PM: Chapter 13
	LO8: Calculate component and system reliability and availability; LO9: Discuss the importance of a network manager and the skills required of that position.	
	Theme 4: Network Diagnostic Tools	PM: Chapter 13
	LO10: Identify the basic hardware and software network diagnostic tools; LO11: Describe the importance of a help desk with respect to managing network operations; LO12: List the main features of the Simple Network Management Protocol (SNMP); LO13: Distinguish between a manager and an agent in the SNMP;	

	LO14: Describe the use of the Remote Network Monitoring (RMON) protocol; LO15: Describe the relationship between RMON and SNMP protocols.	

