



**NCC Education  
Postgraduate Diploma in  
Strategic Business Information  
Technology**

**Lecturer Guide**

**Module 4**

**Computer Networking and Management**

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## Modification History

Revision	Date	Revision Description
V1.0	January 2003	For issue. To replace Professional Systems Engineering.

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# Computer Networking and Management Lecturer Guide

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## How to Use this Lecturer Guide

This Lecturer Guide is in two parts:

- Notes for lecturers – This section contains information needed when teaching this module, including the syllabus.
- Lecturer/Student Notes – These are provided for each chapter and are based around the set of visuals provided. (Both the visuals and the notes correspond with the chapters in the mandatory student textbook.)

*Note: The visuals are provided in Adobe PDF format online for downloading, or on CD if required.*

A series of exercises and problems are available online, at the publisher's web site (the web address and access information is available in the document entitled:

Assessment and Credit Weighting, Reading List and Module Resources  
(file name ACW\_RL\_R.pdf).

After allowing the appropriate time within the lecture/online session for students to carry out an exercise, it is useful to spend time discussing student answers.



# Notes for Lecturers

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## Module Specification

### Duration

This module is of approximately 200 hours duration. Further details are provided in the syllabus, which is reproduced below for convenience.

### Lecturer

The lecturer must be familiar with the syllabus content, in particular:

- computer networks and the Internet;
- application layer;
- protocol layers and their service models;
- multimedia networking;
- network security;
- network management.

### Method of Presentation

This will be determined by the NCC Education approved Training Provider/student and their chosen route of study. Online facilitation will be via the web site through discussion forums, scheduled chats, and response from the facilitators within a 24 hour cycle.

The lectures should be based on the visuals provided. The Lecturer Notes, which also serve as a Student Handout, are provided at the end of this Lecturer Guide, immediately after the Handouts containing the exercises.

Because of the style and presentation of this module, lecturers must carefully review the eight chapters and familiarise themselves with the contents before deciding on a lesson plan to suit their students and their preferred vehicle of learning. The technical background of the students should also be considered when deciding on a lesson plan.

*Also, regarding the method of presentation, please refer to the section entitled 'Module 4: Syllabus Delivery', on Page 9.*

- Lecturer led.
  - Lectures and workshops.
  - Set of visuals for each lecture (available online).
  - Flip chart or whiteboard work.
  - Self study.
- } This is the traditional classroom delivery method of presentation.

With regard to exercises, online trainees should be asked to submit brief, to-the-point responses to the questions through the student assignment drop box. It is recommended that the discussion questions will be included in the online chat sessions.

## Objectives

The objectives are taken directly from the syllabus. The syllabus is repeated here for convenience.

## Syllabus – Computer Networking and Management

### Module 4: Aims

To equip the candidates with knowledge and skills in the underlying principles of networking with special focus on internetworking, while at the same time emphasizing Internet protocols and network applications.

### Module 4: Objectives

On completion of this module, candidates will be able to:

- introduce networking from a new perspective;
- understand the top down approach which begins at the application layer and works its way down towards the physical layer;
- understand and place emphasis on the application layer, which has been the high growth area of computer networking, including the Web, audio and video streaming, and content distribution;
- understand the network applications and the network services needed to support these applications;
- identify a number of fundamentally important issues in transport layer and network layer;
- integrate principles and practice drawn from the internet architecture.

## Module 4: Syllabus Delivery

In order to meet the desired aims and objectives the following flow is suggested. The first chapter of this module presents a self-contained overview of computer networking. Introducing many key concepts and terminology, this chapter sets the stage for the rest of the module. All of the other chapters directly depend on this first chapter.

We recommend that, after completing Chapter 1, lecturers cover Chapters 2 through to 5 in sequence, thereby teaching according to the top-down philosophy. Each of these five chapters leverages material from the preceding chapters.

After completing the first five chapters, there is quite a bit of flexibility. There are no interdependencies among the last three chapters, so they can be taught in any order. However, each of the last three chapters depends on the material in the first five chapters

The first chapter of the text, being comprehensive and self-contained can serve as the foundation on Networking.

## Outline Syllabus

### Chapter 1: Computer Networks and the Internet – Overview

- What is the Internet?
- What is a Protocol?
- The Network Edge
- The Network Core
- Access Networks and Physical Media
- Delay and Loss in Packet-Switched Networks
- Protocol Layers and Their Service Models
- Internet Backbones, NAPs, and ISPs
- A Brief History of Computer Networking and the Internet
- Summary

### Chapter 2: Application Layer

- Principles of Application Layer Protocols
- The World Wide Web: HTTP
- File Transfer: FTP
- Electronic Mail in the Internet
- DNS – The Internet's Directory Service
- Socket Programming with TCP
- Socket Programming with UDP
- Building a Simple Web Server
- Summary

**Chapter 3: Transport Layer**

- Transport-Layer Services and Principles
- Multiplexing and Demultiplexing Applications
- Connectionless Transport: UDP
- Principles of Reliable Data Transfer
- Connection-Oriented Transport: TCP
- Principles of Congestion Control
- TCP Congestion Control
- Summary

**Chapter 4: Network Layer and Routing**

- Introduction and Network Service Models
- Routing Principles
- Hierarchical Routing
- Internet Protocol
- Routing in the Internet
- What is Inside a Router?
- IPv6
- Multicast Routing
- Summary

**Chapter 5: Link Layer and Local Area Networks**

- The Data Link Layer: Introduction, Services
- Error Detection and Correction Techniques
- Multiple Access Protocols and LANs
- LAN Addresses and ARP
- Ethernet
- Hubs, Bridges, and Switches
- IEEE 802.11 LANs
- PPP: The Point-to-Point Protocol
- Asynchronous Transfer Mode (ATM)
- X.25 and Frame Relay
- Summary

**Chapter 6: Multimedia Networking**

- Multimedia Networking Applications
- Streaming Stored Audio and Video
- Making the Best of the Best-Effort Service: An Internet Phone Example
- RTP
- Beyond Best-Effort
- Scheduling and Policing Mechanisms

- Integrated Services
- RSVP
- Differentiated Services
- Summary

### **Chapter 7: Security in Computer Networks**

- What is Network Security?
- Principles of Cryptography
- Authentication: Who are You?
- Integrity
- Key Distribution and Certification
- Secure E-Mail
- Internet Commerce
- Network Layer Security: IPsec
- Summary

### **Chapter 8: Network Management**

- What is Network Management?
- The Infrastructure for Network Management
- The Internet Network-Management Framework
- ASN.1
- Firewalls
- Summary

## **Assessment Methods**

The assessment criteria will be based on the learning objectives.

## **Teaching and Learning Strategies**

The module is based on computer networking, integrating the principles and the practice of internetworking.

## **Indicative Workload Breakdown**

Seminars/Lectures/Practical	<i>80 hours</i>
Coursework/Assignments	<i>40 hours</i>
Directed self study:	<i><u>80 hours</u></i>
Total	<i>200 hours</i>

## Additional Notes

This module is based on one core text; *Computer Networking – A Top-Down Approach Featuring the Internet*, (2<sup>nd</sup> Edition 2002) by James F Kurose, University of Massachusetts & Keith W Ross, Institute of Eurecom.

This publication also provides additional online resources and lecturer materials.

## Suggested Reading List

James F Kurose & Keith W Ross, *Computer Networking – A Top-Down Approach Featuring the Internet*, 2<sup>nd</sup> Edition, ISBN 0-321-17644-8 (the International Edition), ISBN 0-201-97699-4, published by Addison-Wesley, 2002 (<http://www.awl.com/cs>).  
**\*Mandatory Text Book.**

Behrouz A Fourouzan, *Data Communications and Networking*, 2<sup>nd</sup> Edition, Published by McGraw-Hill, ISBN 0-07-043563-4.

## Materials List

- Complete set of visuals corresponding to each chapter.
- Set of Lecturer Notes/Student Notes corresponding to each chapter.

## Bibliography

James F Kurose & Keith W Ross, *Computer Networking – A Top Down Approach Featuring the Internet*, (2<sup>nd</sup> Edition), Addison-Wesley, ISBN: 0 321 17644-8 (the International Edition), ISBN 0-201-97699-4.

W K Gibson, *Neuromancer*, Ace Books, New York, 1984. (Referred to in Chapter 1, Page 9, Visual 6.)

V Cerf and R Kahn, A Protocol for Packet Network Interconnection, *IEEE Transactions on Communications Technology*, Vol. COM-22, No. 5, pp 627-641. (Referred to in Chapter 1, Page 45, Visual 39.)