



Faculty of Computer Studies

T305 A: Digital Communications (Part A)

Course Guide

T305A: Digital Communications (Part A)**Credit Points / Credit Hours:** 30 / 8**Pre-Requisites:**

T209B

Short Description:

This course is appropriate for anyone with an interest in either telecommunications or data and computer communications, including the Internet. Examples are drawn from both mobile and fixed networks, and topics include: protocols (such as the internet protocols: TCP/IP); network management and reliability; digital representation of sounds and images.

Aims:

The aims of this course are:

- To show how telecommunication networks can provide a 'backbone' for data and telephony services.
- To introduce the architecture of communication networks by building up a hypothetical network.
- To show how computers can be connected into local and wide area networks.
- To describe the principles of carrier sense multiple access with collision detection (CSMA/CD).
- To provide a historical context within which the advantages of synchronous digital hierarchy (SDH), over earlier transmission hierarchies, can be discussed.
- To explain the essential features of pulse code modulation (PCM).
- To introduce the concepts of timing and multiplexing in the context of the plesiochronous digital hierarchy (PDH).
- To describe the architecture of SDH in sufficient detail for the important concepts underlying SDH like SDH in action, using performance, optical-fiber rings and network design as discussion topics and how SDH has the basic components to form part of a managed network.
- To describe the message coding for a number of systems (PCM, facsimile, video and audio) in order to present the main techniques used in digital telecommunication systems.

Learning outcomes:

The learning outcomes for this course are given below:

A. Knowledge and Understanding of:

- A1. Communication networks including local area networks (LANs).
- A2. The concept of a communication protocol.
- A3. Time and frequency division multiplexing.
- A4. Managing telecommunication networks.
- A5. Source coding for audio, video and text.

B. Cognitive skills:

After studying the course, the student will be able to:

- B1. Compare the merits of different approaches to fulfilling a digital communication requirement.
- B2. Make use of technical literature and mathematical modeling.
- B3. Understand the possibilities, the theoretical and practical limits and the Compromises inherent in the design of digital communication systems.
- B4. Understand technical descriptions of present and future digital communication equipments, techniques, networks and services.
- B5. Use Communication technology more efficient.

C. Key skills:

After studying the course, the student will be able to:

- C1. Develop abilities to work with technical literature (Journal papers and articles).
- C2. Become more familiar with the way engineers use numbers (including estimations, approximations, and interpretation of probabilistic concepts).
- C3. See how simple algebraic and computer models can be used to gain a better insight into the behavior of engineered systems.
- C4. Develop skills in the areas of written communication and improve own learning.

D. Practical and / or professional skills:

- D1. Information retrieval from the world-wide web.
- D2. Use of spreadsheet package to generate tables, line graphs and bar charts.
- D3. Use of specification and description language (SDL) tool to represent real-Time systems.

Course Structure:

This course is divided into the following **three main blocks**:

Block 1: The first block surveys communication networks, from local area computer networks (LANs) to international telephone networks, and describes and explains protocols such as the internet protocols (TCP/IP).

Block 2: The second block is concerned with the management and reliability of digital communication systems and networks. It includes material on the standards for a telecommunication management network (TMN) and the transmission standards known as the synchronous digital hierarchy (SDH).

Block 3: This block describes the digital encoding of messages, including the digital representation of sounds and images.

Table of Contents:

Block 1: systems and processes

Part 1: communication network architectures

- 1 Introduction
- 2 Communicating across a network
- 3 The internet
- 4 Ethernet (csma/cd)
- 5 Fast and gigabit Ethernet: the development from 10 mbit/s ethernet
- 6 Switched Ethernet
- 7 Conclusions

Block 1: systems and processes

Part 2: communication network protocols

- 1 Introduction
- 2 Protocols and layering
- 3 Tcp/ip protocols
- 4 Connections in tcp
- 5 Interlayer communication
- 6 Conclusion

Block 2: systems and processes

Part 1: synchronous digital hierarchy

- 1 Introduction

- 2 The plesiochr0nous digital hierarchy
- 3 Synchronous digital hierarchy - transport
- 4 Synchronous digital hierarchy - building stm-1
- 5 Network design
- 6 Synchronization - keeping in time
- 7 Performance
- 8 Sonet
- 9 Management of networks

Block 2: systems and processes

Part 2: network management

- 1 Principles of network management
- 2 Managing sdh networks
- 3 Functional architecture
- 4 Management functions and layers
- 5 Information architecture
- 6 Managed objects
- 7 Review of block 2, parts i and 2

Block 3: systems and processes message coding

- 1 Introduction
- 2 Pulse code modulations and delta modulation
- 3 Facsimile
- 4 Video coding
- 5 Speech coding for low 317-rates

Assessment:

- Tutor-marked assignments: 2 TMAs
- Quiz/Mid-term Assessment: 1 MTA
- Final Exam: 1 Final Exam

Grade Distributions:

- Tutor-marked assignments: 35%
- Quiz/MTA: 15%
- Final Exam: 50%

Course Calendar (Indicative Version):

There are 2 Tutor Marked Assignments , 1 Midterm Assessment and 1 Final Exam associated with this course. Course result is determined on the basis of student's scores in TMAs, Midterm Assessment and the Final Exam. To be sure of passing the course, the student needs to score at least 40% (at least 20% in TMA and Quiz/MTA and at least 20% in the final exam) in the above 3 components and achieve an overall average score of 50%.

Study week	Block Companion	Systems and Processes texts	Modeling Activities	Assignment
				Assessments
1	Block 1 Introducing networks	ICT CD-ROM T293 Extract		
3		Communication Network architectures		
4			Representing systems	
5		Communication network protocols		
6	Block 2 Operating networks	SDH		
7				TMA1 due date
8			Probability and Reliability	Quiz / MTA
9		Network Management		
10				
11	Block 3 What goes on the networks		Sinusoids and Fourier series	
12			Information theory	
13		Message coding		TMA2 due date
14		Video coding		
15		Speech coding		
16	Final Exam			