

Module 5: Data Communications and Networks

Stage	1						
Semester	1						
Module Title	Data Communications and Networks						
Module Number/Reference	5						
Module Status (Mandatory/Elective)	Mandatory						
Module ECTS credit	5						
Module NFQ level (only if applicable)	8						
Pre-requisite Module Titles	None						
Co-requisite Module Titles	None						
Is this a capstone module? (Yes or No)	No						
List of Module Teaching Personnel	Dr Faheem Bukhatwa Mr Paddy Fahy						
Contact Hours				Non-contact Hours			Total Effort (Hours)
Lecture	Practical	Tutorial	Seminar	Assignment	Placement	Independent work	
24		12		32		32	100
Allocation of Marks (Within the Module)							
	Continuous Assessment	Project	Practical	Final Examination	Total		
Percentage contribution	40%			60%	100%		

Intended Module Learning Outcomes

On successful completion of this module learners will be able to:

1. Explain basic signaling concepts in digital and analog signals and concepts of multiplexing.
2. Discuss network connectivity, topologies, switching techniques and concepts of shared media access control and their protocols.

3. Explain the detailed framing, error detection techniques used in communication systems
4. Explain the detailed routing techniques for data through data networks
5. Discuss IP addressing (not including subnetting).
6. Explain basic concepts of wireless networks and concepts network security
7. Program or carry out an analytical study on a communication protocol or technique.

Module Objectives

This module provides you with a detailed understanding and appreciation of the different networking and communication concepts, standards and protocols. It addresses basic signaling at physical level up to routing at network layer. The module covers the different protocols commonly found and focusses on available WAN technologies. This module also introduces wireless networks and network security.

Module Curriculum

Introduction to data communications

- Analogue and digital signals.
- Transmission impairments: Attenuation, delay & noise.
- Asynchronous & synchronous transmission.
- Simplex, half / full duplex line configuration.
- Frequency & Time Multiplexing, broadband & baseband.

Introduction to networks

- Network definition - goals and applications.
- Classification of Networks - LAN/MAN/WAN/SAN.
- Network components: Servers, workstations, cabling, network interface cards.

Switching techniques

- Message, datagram, circuit and virtual circuit switching techniques.
- Operations, packets movements and routing, channel utilisation, headers contents, data size, advantages, and disadvantages, performance.
- Permanent Virtual circuits.

Topologies and Media

- ISO/OSI Reference Model and the TCP/IP standard.
- Network topologies: star, ring, bus & mesh.
- Network media selection criteria.
- Cable/Wireless Media: Coaxial, Twisted Pair, fiber optic, satellites
- Shared media, Media access protocols, time division, polling, token passing, CSMA, CSMA/DT

Datalink layer

- Framing, Bit stuffing and stripping
- Error detection, Parity bit, Parity block and CRC Error checks.

- Flow control, sliding window protocols.
- Analysis of go-back-n and selective reject algorithms
- Piggy back acknowledgements
- Hop-to-hop and end-to-end error detection systems

Network layer – routing

- Routing algorithms: types, classes and characteristics of routing algorithms. Fixed, Adaptive, local, distributed, central, Flood,
- Distance Vector routing algorithm and Link state routing algorithm.
- Routing tables.
- Shortest routing algorithms
- Introduction to IP addressing

Wireless networks

- Concepts of wireless networks.
- Problems and applications,
- 802.11a/b/g, VOIP & Bluetooth.

Introduction to communication security

- Passive and active attacks.
- Encryption: symmetric and asymmetric
- Encryption keys, key distribution,
- Confidentiality, integrity, authentication, availability

Reading lists and other learning materials

Forouzan, B. *Data Communications and Networking (4th Edition)*, McGraw-Hill, 2006.

Stallings, W. *Data and Computer Communications (8th Edition)*, Prentice-Hall, 2006.

Additional Reading

Halsall, F. *Data Communications, Computer Networks and Open Systems (4th Edition)*, Addison-Wesley, 1996.

Rappaport, T. S. *Wireless Communications: Principles and Practices (2nd Edition)*, Prentice-Hall, 2002

*Tanenbaum, A. S. *Computer Networks (4th Edition)*, Prentice-Hall, 2002.

Module Learning Environment

Accommodation

Lectures are carried out in class rooms / lecture halls in the College. Tutorials are partially carried out in class and partial are at labs throughout the Campus.

Library

All learners have access to an extensive range of physical and electronic (remotely accessible) library resources. The library monitors and updates its resources on an on-going basis, in line with the College's Library Acquisition Policy. Lecturers update reading lists for this course on an annual basis as is the norm with all courses run by Griffith College.

Module Teaching and Learning Strategy

The module is delivered through a combination of lectures, tutorials and practical lab programming sessions. The learners complete a series of tutorials throughout the module which build on the learning in lectures.

Module Assessment Strategy

The module assessment consists of 1) continuous work and 2) a final examination.

Element No	Weighting	Type	Description	Learning Outcome assessed
1	10%	Weekly Tutorial Submission	Work material aims at enhancing the understanding of material covered.	1,2,3,4,5,6
	10%	Assignment	Programming or report writing on a particular topic of networks	1,2,3,4,5,6,7
	20%	Mid-term test	Evaluation of the learner attainment of material covered	1,2,3,4,5
2	60%	Closed Book Examination	End of Module Examination	1,2,3,4,5,6,7