



This course is being offered at Griffith College, CAPA's academic partner in Dublin. The Irish academic system differs from the US, particularly with grading. Griffith College professors expect students to undertake a good deal of independent study to achieve a high mark in their classes. For additional information about this class, please contact the Boston Program Advising Team at 1-800-793-0334.

Networks and Data Communications

Continuous Assessment: 40%

Exam: 60%

Intended Module Learning Outcomes

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

1. Understand basic network concepts and network models.
2. Understand network connectivity, topologies, data switching techniques and concepts of media access control and their protocols.
3. Understand analog and digital signals and signaling, as well as signal impairments.
4. Understanding signal encoding techniques and scrambling methods
5. Understand IP/TCP protocols and the IP addressing scheme.
6. Understand concepts of electronic mail systems.
7. Recognize basic concepts of wireless networks.
8. Implement through programming or a detailed study a simple communication system functionality or protocol

Module Objectives

This module provides you with a detailed understanding and appreciation of communication networks layouts and a wide range of networking standards and protocols. The module concentrates on the physical layer, signaling and signal encoding schemes. This module also covers higher level network protocols which enhance knowledge about communication in networks. It also provides a basic understanding of wireless networks.

Module Curriculum

Introduction to networks

- Network definition - goals and applications.
- Classification of Networks - LAN/MAN/WAN/SAN.
- Network devices: Repeaters, Hubs, Bridges, Switches, Routers and Front gates
- Network components: Servers, workstations, cabling, network interface cards. Simplex, half / full duplex line configuration.
- Asynchronous & synchronous transmission.

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/CD

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.

Signals and signal impairment

- Analogue and digital signals, frequencies, bandwidth,
- Digitizing analogue signals,
- Graphing sine waves, complex wave forms, harmonic waves.
- Transmission impairments: Attenuation, delay & noise.
- Channel capacity, Nyquist Bandwidth, Multilevel Signaling, Shannon Capacity Formula

Encoding schemes

- Encoding techniques for: Analogue data over an analogue medium and Analogue data over a digital medium
- Encoding techniques for: Digital data over an analogue medium and Digital data over a digital medium
- NRZ-I, NRZ-L, Manchester, Bipolar AMI encoding, multilevel and two level binary schemes.
- Scrambling techniques, B8ZS and HDB3 scrambling.

IP/TCP protocols

- Addressing concept, port number, physical and the IP addresses.
- IP4 and IP6, Classfull and classless IP addresses
- IP addresses, classes or address class,
- CIDR (Classless Inter-domain Routing)
- IP 4 packets, TTL fields, IP packet fragmentation and reassembly.
- Address resolution protocol (ARP)
- Reverse ARP (RARP)
- TCP protocol and reliable transmission.
- UDP protocol
- Network Address Translation (NAT)
- Internet Control Message Protocol (ICMP)
- Domain Name System (DNS)
- Network utilities, ping, ipconfig.

Wireless networks

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

Email systems

- Introduction to email systems
- The email handling system architecture
- Sending an email message (SMTP)
- Mail retrieval (POP3)
- Internet Message Access Protocol (IMAP)
- Email attachments
- Multipurpose Internet Mail Extension (MIME)
- Sending and retrieval of mail