Course Title: WANs and Communication Protocols

Course Code: EE3016

Units: 3

Level: B3

Course Aims and Objectives:
The aim of this course is to explore both the architectural principles and the mechanisms required for the exchange of data among computers, workstations, servers, and other communication systems. It is also to examine the internal mechanisms and technologies that have been developed to support voice, data, and multimedia communications over Wide-Area Networks.

The primary objective of this course is to provide both a high-level theory and detailed analysis of protocols, operation, standards, technology, and services for data networks. The course also focuses on the practical application of the technology, rather than a dry review of the standards or a parochial view of the technology from the protocol level.

Intended Learning Outcomes:
On completion of this course, the students will be able to

1. Explain and describe the principles of circuit switching and packet switching
2. Analyze and design multistage circuit switches
3. Recognize the design principles of the wide area networking technologies covered in this course
4. Apply the routing algorithms covered in this course
5. Recognize the design principles of IP and TCP

Syllabus:
Circuit Switching
Circuit-Switching Networks; Digital Switching Concepts: Space-Division and Time-Division Switching; Routing in Circuit-Switched Networks; The Telephone System.

Packet Switching
Packet Switching Techniques; Comparison of Circuit Switching and Packet Switching; Virtual Circuits and Datagrams; Routing and Congestion Control; X.25 Networks: Packet Format, Flow and Error Control.

Frame Relay
Origins and Structure of Relay Network; Frame Relay Protocol Architecture; Frame Relay Call Control; Traffic and Congestion Aspects of Frame Relay.

ISDN and Broadband ISDN
Overview of ISDN; ISDN Interfaces and Functions; ISDN Protocol Architecture: Physical, Data Link and Network Layer; Broadband ISDN: Services, Architecture, Protocols.

Asynchronous Transfer Mode (ATM)
ATM Protocol Architecture; Transmission of ATM Cells; ATM Adaptation Layer.

Protocols and Architecture
Protocols and Network Architecture; The OSI Reference Model; The TCP/IP Reference Model; Comparison of the OSI and TCP Reference Model.

Internetworking
Principles of Internetworking; Connectionless Internetworking; The Internet Protocol (IP); IP Routing Protocol; Fragmentation and Reassembly of IP; IPv6: a new version of IP.

Transport Protocols

Laboratory Experiment:
Nil

Teaching Pattern
Duration of course: 1 semester
Suggested lecture/tutorial/laboratory mix: Lecture Hour 26 Hours
              Tutorial Hour 8 Hours
              Laboratory Hour 12 Hours

Assessment Pattern:
Examination duration: 2 hours, at the end of the semester
Percentage of coursework, examination, etc.: 30% CW (including 10% Laboratory)
                                           70 % Exam

For a student to pass the module, at least 30% of the maximum mark for the examination must be obtained, and a laboratory attendance of at least 75% recorded.

Pre-requisites: (Please quote course code and title)
EE3015 Computer Networks
or
EE3900 Computer Networks
or
EE2310 Networking I
or
EE3010 Data Communications and LANs

Pre-cursor: (Please quote course code and title)
Nil

Exclusive Course: (Please quote course code and title)
EE4010 WANs and Communication Protocols (for BEECE & BEECE2 students ONLY)

Equivalent Courses: (Please quote course code and title)
Nil

Equivalent Old Course Code and Title: (Please quote course code and title)
EE3311 Networking II
or
EE4010 WANs and Communication Protocols

**Textbook:**

**Reference Book**