Course Title: Internet Technologies and Protocols

Course Code: EE3320

Units: 3

Level: B3

Course Aims and Objectives:
This course aims to provide students with the knowledge of key technologies and protocols in the TCP/IP protocol suite. It will look at technologies which transform the Internet from its data-only roots to a true multi-service network that can handle voice, video and multimedia with comparable quality and reliability.

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

1. Apply network programming techniques to write some common application protocols
2. Understand the problems of implementing IP routing protocols and the ways to fix them
3. Understand the TCP retransmission mechanism and be able to estimate the round trip time and decide the retransmission timeout value.
4. Know the principles for TCP to ensure a reliable connection establishment and termination.
5. Understand the principles for TCP flow and congestion controls and be able to calculate the TCP flow control and congestion window sizes under different working/congestion conditions.
6. Understand the principles for MPLS, IntServ, DiffServ and Multicast routing

Syllabus:
Application Layer
Review of common Internet services and protocols: DNS, Telnet, FTP, SSH, SMTP/POP/IMAP, MIME, HTTP
Network Programming: Socket API with implementation of DNS, Telnet, FTP, SSH, SMTP/POP/IMAP/MIME or HTTP

TCP
Addressing: TCP connection, TCP endpoint, TCP port
Retransmission strategy: positive acknowledgements, retransmission timeout, adaptive retransmission algorithm
TCP Flow control: credit allocation scheme, window advertisement
Connection establishment: problems with two-way handshake, three-way handshake
Connection termination: graceful termination, modified three-way handshake
Congestion Control: Slow Start, Congestion Avoidance, Fast Retransmit, Fast Recovery

Internet Routing Protocols
Review of Internet Protocol (IP)
Hierarchical routing
Internet routing protocols: RIP, OSPF, IGRP, EGP, BGP

Multi-Protocol Label Switching (MPLS)
Problems on the Internet and the solution: MPLS
How MPLS works
- Packet forwarding & Label Switching
- Label Distribution
- Label Allocation Schemes
Examples of IP routing vs. MPLS routing
Virtual Private Network (VPN)

Quality of Service in Internet
Integrated Services (IntServ): Resource Reservation Protocol (RSVP)
Differentiated Services (DiffServ): Per-Hop Behaviors (PHB), Expedited Forwarding (EF), Assured Forwarding (AF), Traffic Conditioner Block (TCB)

Multicast Routing
Source-duplication vs. in-network duplication
Source-based tree vs. group-shared tree
Shortest path trees and reverse path forwarding, minimal spanning (Steiner) tree, center-based trees
Internet multicast routing: distance vector multicast routing protocol (DVMRP)

Laboratory Experiment:
Nil

Teaching Pattern:
Duration of course: 1 semester
Suggested lecture/tutorial/laboratory mix: Lectures: 26 hours
                                         Tutorials: 13 hours
                                         Laboratory: 18 hours

Assessment Pattern:
Examination duration: 2 hours, at the end of the semester
Percentage of coursework, examination, etc.: 30% CW; 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 & title)
EE2310 Networking I
or
EE3015 Computer Networks
or
EE3900 Computer Networks

Pre-cursor: (Please quote course code & title)
EE3311 Networking II
or
EE3016 (old code: EE4010) WANs and Communication Protocols

Exclusive Course: (Please quote course code & title)
Nil
Equivalent Courses: (Please quote course code & title)
Nil

Equivalent to the old Course Code and Title: (Please quote course code & title)
Nil

Textbook:

Reference Book: