Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2020-2021

Course Handout Part II

Date: 16-01-2021

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **CS F303**
Course Title : **Computer Networks**
Instructors : Dipanjan Chakraborty (IC), Suvadip Batabyal, Nikumani Choudhury

Scope and Objective of the Course:

- This course will give you a breakdown of the applications, communications protocols, and network services that make a computer network work.
- We will closely follow the top down approach to computer networking, which will enable you to first understand the most visible part i.e. the applications, and then seeing, progressively, how each layer is supported by the next layer down.
- Most of the time our example network will be the Internet.
- A chapter on wireless and mobile networks will be covered as currently users access the Internet from offices, from homes, while on the move, and from public places using wireless media.
- We will also cover Multimedia Networking towards the end of the course.

Textbooks:

1. [T1] James F. Kurose and Keith W. Ross: Computer Networking: A Top-Down Approach, Sixth Edition, 2013, Pearson.

Reference books

1. [R1] Andrew S. Tanenbaum, Computer Networks, Fourth Edition, Pearson Education, 2006.
2. [R2] B A Forouzan, and F Mosharraf, Computer Networks: A Top Down Approach, TMH, SiE, 2012.
3. [R3] L. Peterson and B. Davie, Computer Networks: A Systems Approach, Fourth Edition, MK, 2007.
4. [R4] James F. Kurose and Keith W. Ross: Computer Networking: A Top-Down Approach, Seventh Edition, 2017, Pearson.
5. [R5] Behrouz A. Forouzan: Data Communications and Networking, 5th edition, 2013
6. [R6] James F. Kurose and Keith W. Ross: Computer Networking: A Top-Down Approach, Eighth Edition, 2020, Pearson.

Course Plan:

Sl. No.	Learning Objectives	Topics to be covered	Chapter in the Text Book	No. of Lectures
1.	Usage of Computer networks and its hardware structure.	Introduction: Uses of Computer Networks, Network Hardware: The Network Edge, The Network Core, Access Networks.	T1(1)	2
2.	Internet architecture and performance bottlenecks and Software architecture.	ISPs and Internet Backbones, Delay and Loss in Packet Switched Networks, Network Software: Protocol Hierarchies, and their Service Models.	T1(1)	2
3.	Example protocol stacks.	Reference Models (OSI, TCP/IP)	T1 (1)	1
4.	World wide web and its' application layer protocol.	Application Layer: Hypertext Transfer Protocol, HTTP Message Format, Cookies, Conditional GET.	T1 (2)	2
5.	E-Mail application and domain name systems.	Simple Mail Transfer Protocol, Domain Name Systems (DNS).	T1 (2)	2
6.	Socket API for building applications.	Socket Programming with TCP and with UDP.	T1 (2)	2
7.	Transport layer fundamentals: Reliable and Un-reliable principles.	Transport Layer: Multiplexing, Demultiplexing, UDP, Principles of Reliable Data Transfer (Go-Back-N, and Selective Repeat).	T1 (3), R1 (6)	2
8.	Flow control mechanism and Round trip time estimation.	TCP: Segment structure, RTT Estimation and Timeout, TCP Flow Control.	T1 (3), R1 (6) R3 (5)	2
9.	Understanding the principles behind reliable packet delivery.	TCP Error Control and Congestion Control.	T1 (3), R3 (6)	2
10.	Learning various types of services at network layer.	Network Layer: Virtual Circuits and Datagram Networks, what is Inside a Router? Forwarding and Addressing in the Internet.	T1 (4), R1 (5)	2
11.	Learning different approaches to find out paths within a subnet.	Routing Algorithms: Shortest Path, Flooding, Link State, Distance Vector, and Hierarchical Routing.	T1 (4), R1 (5)	3
12.	Example routing in real Internet.	Routing in the Internet: RIP, OSPF, Border Gateway Protocol, and Multicasting.	T1 (4), R1 (5)	3
13.	Features of data link layer and its' importance in a network stack.	Data Link Layer: Services, Error Detection and Correction Techniques (Parity Checks, Checksums, CRC).	T1 (5), R1 (3)	2
14.	Various protocols at MAC layer to control access to the broadcast medium.	Multiple Access Protocol: Slotted ALOHA, ALOHA, CSMA, Local Area Networks.	T1 (5), R1 (4)	3
15.	Credentials and popular MAC layer protocol.	Link Layer Addressing: MAC Addresses, ARP, DHCP; Ethernet: Frame Structure, CSMA/CD.	T1 (5), R1 (4)	2
16.	Devices at data link layer.	Interconnections: Hubs, and Switches.	T1 (5), R3(3)	1
17.	Connection oriented service over a Network layer stack.	Link Virtualization: Multiprotocol Label Switching (MPLS).	T1 (5)	2

18.	Characteristics of Wireless network, cellular architecture and their protocols.	Wireless Networks: Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LAN Architecture and Protocol, Cellular Internet access.	T1 (6)	2
19.	IP mobility for supporting mobile users.	Mobile Networks: Mobility management, Mobile IP.	T1 (6)	1
20.	Physical layer characteristics and link types. Inherent characteristics of these links.	Physical Media: The theoretical basis for data communication (Fourier Analysis, Bandwidth Limited Signals, Maximum Data Rate of a Channel), Guided physical media.	R1 (2), R3 (1)	2
21.	Multimedia Networking	Applications, audio, video, VoIP, network support for multimedia	T1(7)	2
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Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Comprehensive examination	2 hours	40%	03/05 FN	Open
Mid-term examination	1.5 hours	25%	01/03 3.30 -5.00PM	Open
Assignments (2 nos.) (15% for mid-sem grading)	Rolling	30%	TBA	Take home, open material
Lab Test	TBA	5%	TBA	Open

Chamber Consultation Hour: TBA
Notices: To be circulated through CMS and an appropriate discussion forum

Make-up Policy:

- Late submission of assignments will incur a penalty of 10% per day.
- Make up for **mid-term and comprehensive examinations** will be allowed only in extreme situations and institute rules will apply. However, *prior permission* from the IC is compulsory.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE