SECOND SEMESTER 2019-2020
Course Handout Part II

Date: 28-11-2019

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, Manik Gupta, D V N Siva Kumar

Scope and Objective of the Course:

- This course will give you a breakdown of the applications, communications protocols, and network services thatmake 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

innovate   achieve   lead

Course Plan:

Sl. No.	Learning Objectives	Topic	Chapters	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

Old Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Comprehensive examination	3 hours	35%	9th May, 2020, afternoon	Written, closed book
Mid-term examination	1.5 hours	25%	-	Written, closed book
Programming Assignments	Rolling	20%	TBA	Take home and in-lab, open material
In-lab evaluations	Each lab session	5%	-	-
In-class Assignments	Rolling, can happen in the lectures or tutorials	15%	unannounced	In-class, open material

New Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Comprehensive examination	3 hours	40%	9th May, 2020, afternoon	Written, closed book
Mid-term examination	1.5 hours	25%	-	Written, closed book
Programming Assignments	Rolling	25%	TBA	Take home and in-lab, open material
In-lab evaluations	Each lab session	5%	(see New evaluation policy below)	-
In-class Assignments	Rolling, can happen in the lectures or tutorials	5%	Unannounced (see New evaluation policy below)	In-class, open material

Chamber Consultation Hour: TBA

Notices: To be circulated through CMS and Piazza

innovate achieve lead

Old Evaluation and Make-up Policy:
- **Programming Assignments.** will be divided into sub-parts which the students should do over a week. In each lab session, the instructors will evaluate the sub-part for the preceding week. In the last week for an assignment, the student(s) will show the entire assignment end to end. All assignments are compulsory. If a student is late to submit a penalty of 10% per day will apply.
- **In-class Assignments.** All unattempted in-class assignments will be counted with a zero score. Ceiling of top 70% scores for in-class assignments (including unattempted in-class assignments) will be counted. For example, if a student scores the following in 10 in-class assignments: [UA, 10, 4, 7, UA, UA, 9, 0, 8, UA], the scores which will be counted are: [UA, UA, UA, UA, 10, 9, 8].
- 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.

New Evaluation and Make-up Policy:
- **Lab Assignments.** Owing to the constraints we are operating under, we will only consider labs for evaluation when the institute is/was open because not all students have the hardware or bandwidth individually. When the institute is closed, we may release lab sheets and expect the students to work on them on their own. However, we will not evaluate the labs when the institute is closed. It is expected the students will work on the lab sheets on their own as it is an important part of the course.
- **In-class Assignments.** In-class Assignments will only be given when the institute is open as not all students have the bandwidth to participate live during the online classes. For evaluations, we will consider n-1 in-class assignments from when the institute is/was open.
- 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.

NC Policy

Only writing the mid semester and comprehensive examination is not sufficient to clear this course. If an honest attempt is not made to learn in the course by attempting the assignments and the other components, an NC grade will summarily be awarded.

Academic Honesty and Integrity Policy:

The highest level of academic honesty and sincerity is expected in the course. It is OK to make mistakes and learn honestly. Any attempts at gaming the system or colluding with other students (or groups of students for group activities) will attract a zero score for that component and also a grade penalty. Repeat offenders will be reported for disciplinary proceedings. All programming assignments will be checked for collusion using code similarity software. For a good reference on cheating vs. collaboration see
http://www.cse.iitd.ac.in/~mausam/courses/col772/spring2019/

INSTRUCTOR-IN-CHARGE