National University

of Computer & Emerging Sciences

Tentative Course Outline of BS (CS) Degree Program

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Course Title	Computer Networks	**Course Code**	CS307
Pre-Req.		**Credit Hrs.**	3+1

Text Book	**Title**	**Computer Networking: A Top-Down Approach (7th Ed. 2017)**
	Author	Kurose and Ross
	Publisher	Pearson Education (**ISBN 978-0-13-359414-0**)
Ref. Books	**Title**	**Computer Networks (5thEd. 2011)**
	Author	Tanenbaum and Wetherall
	Publisher	Pearson Education (ISBN 978-0-13-212695-3)
	Title	**Computer Networks: A Systems Approach(5th Ed. 2012)**
	Author	Larry Peterson and Bruce Davie
	Publisher	Morgan Kaufmann (ISBN 978-0-12-385059-1)

Objectives:	The learning and skill based objectives of this course resolve around the following questions: • How does the global network infrastructure work and what are the design principles on which it is based? • In what ways are these design principles compromised in practice? • How should Internet applications be written, so they can obtain the best possible performance both for themselves and for others using the infrastructure? • How do we ensure that it will work well in the future in the face of rapidly growing scale and heterogeneity? The course will focus on the design & undergraduate level analysis of large-scale networked systems and GNS3 based implementation and evaluation of small-scale networked

Week	Tentative course topics	Lab Topics	Chapter Sections
01	L1: Introduction, Course L2: Network Edge, Network Core (ISPs, internet Vs. intranet, Internet) L3: Process to Process and Host to Host connectivity		**1.1 to 1.6**
02	L1: Network Core: Packet and Circuit Switching. Statistical Multiplexing L2: ISPs and Internet Backbones (Tiers of ISPs) L3: What are the Requirements for building a Network?		
03	L1: Delay, Loss and Throughput in Packet- Switched Networks, L2: Delay-Bandwidth Product, End-to-End delay, Application Performance L3: Protocols Layers and Their Service Model, **Traceroute**		
04	L1: Principles of Network Applications L2: Email and Domain Naming Service, L3: Peer-to-Peer Application (detail with math equations)		**2.1 to 2.7**
05	L1: Video streaming and Content distribution networks L2: Bit-Torrent Protocol and brief introduction to Distributed Hash Tables L3: Socket Programming. Java Example and DEMO **Semester Project Part-I (Due before Midterm # 1)**		
06	**Mid Term 1**		-

07	L1: Into. to transport layer. Multiplexing & De-multiplexing L2: UDP – Detailed coverage (Examples of application using UDP) L3: Principle of Reliable Data Transfer, rdt 1.0, rdt 2.0, rdt 3.0		3.1 and 3.2 3.3 and 3.4
08	L1: Pipelined Data Transfer L2: Go-Back-N Protocol L3: Selective Repeat Protocol		3.4 (contd.)
09	L1: Connection Oriented Transport: TCP, Round-Trip-Time and Timeout L2: TCP - Congestion control (End-to-End + Network Assisted) L3: TCP - Flow Control		3.5, 3.6 and 3.7
10	L1: Network Layer. Data vs Control planes, Forwarding vs Routing L2: Router architecture. Input/output processing, Switch fabrics L3: Queueing and Active Queue Management (e.g. RED)		4.1 and 4.2
11	L1: Packet Scheduling (FIFO, priority, round-robin, and weighted queues) L2: Internet Protocol (IP) V4 detailed coverage L3: IP fragmentation and reassembly **Semester Project Part-II (Due before Midterm # 2)**		4.3 and 4.4
12	**Mid Term 2**		-
13	L1: IP addressing, sub-netting and super-netting as per textbook L2: IPV6 and Transitioning from IPV4 to IPV6 L3: Generalized forwarding and SDNs. Basics of OpenFlow		3.6 and 3.7
14	L1: Routing Algorithms: Definitions, types, and Inter/inter AS routing. L2: Link-State and Distance Vector (detailed coverage as per book) L3: Intra-AS routing in the Internet: RIP protocol (Distance Vector)		5.2
15	L1: OSPF protocol (Link-State) L2: Routing among ISPs: BGP protocol (Path vector) L3: Routing among ISPs: BGP attributes. **Semester Project Part-III and grading**		5.3 and 5.4
16	L1: Link Layer, Switches, ARP, and VLAN L2: Network Security Overview L3: Optional topic (e.g. Datacenter Networks and IoT Networks)		6.4 and 8.x

Pre-Requisites:

Students enrolled in this course are expected to have completed following course tracks:

1. Digital Logic Design, COAL, Computer Architecture
2. Computer Programming, Object Oriented Analysis and Design

Theory Marks Distribution (out of 100):

Mid Terms (1 & 2) ……. 30%
Class Participation& Notes / Attendance … 5%
Quiz / Assignment / Project ……..... 25%
Final Examination ……..…… 40%

Plagiarism:

Mark will be detected and the case shall be reported to the HOD and/or DC.

Rules & Regulation:

Rules and regulations related to attendance, all type of exams, class work, homework and others shall be observed as per FAST-NU policy and/or communicated by the HOD CS department or in absence of the same as communicated by the course instructor during the semester. **See Lecture # 1 slides for more coverage**.