Course Handout (Part II)

Date: 05.02.2024

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

Course No	:	**CS F303 (314)**
Course Title	:	**Computer Networks**
Instructor-in-charge	:	**Dr. Pranav M Pawar**
Instructors	:	**Dr. Raja Muthalagu, Dr. Tamizharsan PS,**
		Dr. Pranav M Pawar

Scope and objective of the course:
The course aims at providing a sound conceptual foundation in the area of Computer Networks with emphasis on the design aspects. The course attempts to provide a balanced treatment of the state-of-the-art in the area and thus prepares the students for taking more rigorous and specialized courses in this and related fields. At the end of this course, students should be able to analyze, design, troubleshoot and maintain commonly used network types apart from being able to begin Network-oriented Software development.

Course Pre/Co- requisite (if any) **& Catalogue / Bulletin Description:** *Given in the Bulletin 2023 – 24*

Study Material:

Text book:
[T1]. Larry L. Peterson & Bruce S. Davie: Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann / Elsevier, New Delhi, 2011
[T2] James F. Kurose & Keith W. Ross "Computer Networking: A Top-Down Approach Featuring the Internet",Sixth Edition,Pearson,2017.

Reference Book:
[R1]. Forouzan B A: Data Communications and Networking, McGraw Hill, 4th Edition, 2006.

Course plan:

Sl.No.	TOPIC	CHAPTER Ref	Lects.
1.	*Introduction*: Uses of Computer Networks, Network Hardware: The Network Edge, The Network Core, Access Networks.	Class notes	2
2.	*Physical Media*: The theoretical basis for data communication (Fourier Analysis, Bandwidth Limited Signals, Maximum Data Rate of a Channel)	T1 (1), T2(1)	2
3.	ISPs and Internet Backbones, Delay and Loss in Packet Switched Networks, Network Software: Protocol Hierarchies, and their Service Models.	T1 (1), T2(1)	3

4.	Reference Models (OSI, TCP/IP)	Class notes	2
5.	*Data Link Layer*: Services, Error Detection and Correction Techniques (Parity Checks, Checksums, CRC).	T2 (5), T1(2)	3
6.	Multiple Access Protocol: TDM, ALOHA, Slotted ALOHA, CSMA in Local Area Networks.	Class notes	3
7.	Link Layer Addressing: MAC Addresses, ARP, DHCP; Ethernet: Frame Structure, CSMA/CD. Multiprotocol Label Switching (MPLS).	T2 (5), T1(2)	4
8.	Interconnections: Hubs, and Switches.	Class notes	2
9.	*Wireless Networks*: Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LAN Architecture and Protocol,	T2(6)	2
10.	*Network Layer*: Virtual Circuits and Datagram Networks, What is Inside a Router? Forwarding and Addressing in the Internet.	Class notes	2
11.	Routing Algorithms: Shortest Path, Flooding, Link State Vector	T2(4)	3
12.	Routing in the Internet: RIP, OSPF, Border Gateway Protocol	T2(4)	3
13.	*Mobile Networks*: Mobility management, Mobile IP.	T2 (6)	1
14.	*Transport Layer*: Multiplexing, Demultiplexing, UDP, Principles of Reliable Data Transfer	Class notes	2
15.	TCP: Segment structure, RTT Estimation and Timeout, TCP Flow Control.	T2 (3)	2
16.	TCP Error Control, and Congestion Control.	T2(3)	2
17.	Socket Programming with TCP and with UDP.	T2 (2)	2
18.	*Application Layer*: Hypertext Transfer Protocol, HTTP Message Format, Cookies, Conditional GET,FTP,peer-peer applications	T2 (2)	2
19.	Simple Mail Transfer Protocol, Domain Name Systems (DNS).	T2 (2)	2
20.	*Network Security:* Overview of network Cryptography	Class notes	1
21.	*ML for Networking*	Class Notes	1

Class notes also have to be referred for all the above topics
Total number of classes planned=45
* The lectures may slightly diverge from aforesaid plan based on students 'background & interest in the topic, which may perhaps include special lectures and discussions that would be planned and schedule notified accordingly.

Tutorial classes will be of problem-solving nature and may also contain coding/implementation aspects on the theory covered in the classes. You may discuss the meaning or intent of a problem given in the lab/tut with instructors. Tut/ Lab record is to be maintained by everyone and is required at the end to be submitted to I/C.

Lab Practical: The following topics are covered in the lab.

Sl#	Topics	Sessions (2 classes per week)	Venue
1	Introduction to different networking commands.	1	

2	Introducing basic router commands & Simulating a router configuration (Static) using CISCO Packet Tracer	1	**Room No. 335**	
3	Simulation of Dynamic routing using CISCO Packet Tracer	1		
4	Simulation of Subnetting using CISCO Packet Tracer	1		
5	Capture HTTP packet using Wireshark and analyses layer wise header.	1		
6	Using Wireshark explore the ARP and ICMP protocols.	1		
7	Develop a multithreaded TCP server and verify the same using a telnet client and TCP client.	1		
8	Develop a UDP server using java and verify using the UDP client	1		
9	Simulation of wired network topology using Network Simulator-2	1		
10	Simulation of LAN using Network Simulator-2	1		
11	Simulation of Wireless Network using Network Simulator-2	1		
12	Introduction to NetSim and simulating Wired & Wireless networks	1		

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students should be able to:
- **CLO1** Understand the fundamental concepts of networking, layer network model, standards, protocols and technologies.
- **CLO2** Describe, analyze and evaluate a different datalink, network, and transport layer protocols.
- **CLO3** Identify the different computer network components and design the computer network as per the requirements.
- **CLO4** Understand the working principals of different application layer protocols.
- **CLO5** Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.

Evaluation Scheme (OB - Open Book, CB - Closed Book, TBA – To Be Announced):

S.No.	Component	OB/CB	Duration	Weightage	Date &Time
1.	Mid Sem Test	OB*	90 Minutes	30%	01.04.24 AN
2.	Mid Semester Lab Exam	CB	90 Minutes	10%	TBA
3	Quiz (online)	CB	20 Minutes	10%	08.05.24 (W6)
4.	End semester Lab Exam	CB	90 Minutes	15%	TBA
5.	Comprehensive Exam	CB	3 hours	35%	31.05.24 AN

* Only prescribed text book(s), Reference book and hand-written notes are permitted

Mapping of CLOs, PLOs, and ECs (PLO-Program Learning Outcomes, Evaluation Components):

CLOs	PLOs	Evaluation Components (ECs)				
		EC1	EC2	EC3	EC4	EC5
CLO1	1,2	√	√			√
CLO2	2,3	√	√	√	√	√

CLO3	2,3,4,5		√			√
CLO4	2,3				√	√
CLO5	3,4,5,6,7,8				√	√

Mid-sem Grading:
Mid-sem grading will be displayed after three evaluation components or earlier whenever about 40 % of evaluation components are completed.

Note: A student will be likely to get "NC", if he / she
● Doesn't appear / appear for the sake of appearing for the evaluation components / scoring zero in   pre-compre total.
● Scoring zero in the lab component / Abstaining from lab classes throughout.

Makeup and Attendance policies:
Make-ups are not given as a routine. It is solely dependent upon the genuineness of the circumstances under which a student fails to appear in a scheduled evaluation component. In such circumstances, prior permission should be obtained from the Instructor-in-Charge (I/C).The decision of the I/C in the above matter will be final.

Attendance: Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfill all other tasks assigned to him/her in every course. A student should have a minimum of 60% of attendance in a course to be eligible to appear for the Comprehensive Examination in that course. For the students under the purview of Academic Counseling Board (ACB), the Board shall prescribe the minimum attendance requirement on a case-to-case basis. Attendance in the course will be a deciding factor in judging the seriousness of a student which may be directly / indirectly related to grading.

General instructions:
Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

Notices: All notices concerning the course will be displayed on the respective Notice Boards and Google class room. Optionally, if there is a need, email to your BITS mail would be used on short notice and therefore you should activate your BITS mail. All official communications will be sent to your BITS email only.

Course instructors contact information:

Instructor Name	Email Id	Chamber consultation hour	Chamber# & contact Tel#
Dr. Raja Muthalagu	raja.m@dubai.bits-pilani.ac.in	Thursday 9th hour	233 ,042753700 Ext. – 325
Dr. Tamizharasan PS	tamizharasan@dubai.bits-pilani.ac.in	Thursday 9th hour	333, 042753700 Ext. – 442
Dr. Pranav M Pawar	pranav@dubai.bits-pilani.ac.in	Thursday 7th hour	238, 042753700 Ext. – 304

(Dr. Pranav M Pawar)

Instructor In-Charge
CS F303 (Computer Networks)