Fr. Conceicao Rodrigues College Of Engineering

Fr. Agnel Ashram, Bandra

Department of Computer Engineering

Course Outcomes & Assessment Plan

T.E. (Computer) (Semester V)

Subject: Computer Networks

Subject Code: CSC 503

Academic Term: *July – Nov 2022*

Teacher: *Merly Thomas Puthiyadom*

Syllabus:

Module No.	Hrs	Topics	
1.0	4	**Introduction to Networking**	
		1.1 Introduction to computer network, network application, network software and hardware components (Interconnection networking devices), Network topology, protocol hierarchies, design issues for the layers, connection oriented and connectionless services 1.2 Reference models: Layer details of OSI, TCP/IP models. Communication between layers.	10%
2.0	3	**Physical Layer**	
		2.1 Introduction to Communication Electromagnetic Spectrum 2.2 Guided Transmission Media: Twisted pair, Coaxial, Fiber optics.	10%
3.0	8	**Data Link Layer**	
		3.1 DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction (Hamming Code, CRC, Checksum), Elementary Data Link protocols, Stop and Wait, Sliding Window (Go Back N, Selective Repeat) 3.2 **Medium Access Control sublayer** Channel Allocation problem, Multiple access Protocol (Aloha, Carrier Sense Multiple Access (CSMA/CD)	20%
4.0	12	**Network layer**	
		4.1 Network Layer design issues, Communication Primitives: Unicast, Multicast, Broadcast. IPv4 Addressing (classful and classless), Subnetting, Supernetting design problems, IPv4 Protocol, Network Address Translation (NAT), IPv6 4.2 **Routing algorithms**: Shortest Path (Dijkstra's), Link state routing, Distance Vector Routing 4.3 **Protocols** - ARP, RARP, ICMP, IGMP 4.4 **Congestion control algorithms**: Open loop congestion control, Closed loop congestion control, QoS parameters, Token & Leaky bucket algorithms	30%
5.0	6	**Transport Layer**	
		5.1 The Transport Service: Transport service primitives, Berkeley Sockets, Connection management (Handshake), UDP, TCP, TCP state transition, TCP timers 5.2 TCP Flow control (sliding Window), TCP Congestion Control: Slow Start	15%
6.0	6	**Application Layer**	
		DNS: Name Space, Resource Record and Types of Name Server. HTTP, SMTP, Telnet, FTP, DHCP	15%
	39	**Total**	**100**

The high-level learning objective of this course can be summarized as follows:

• *Thinking in a networked world.* The world is more and more interconnected and the use of networks will continue to increase. Students must understand how the network behaves and the key principles behind the organization and the operation of the computer networks.

• *Continued study.* The networking domain is rapidly evolving and this first networking course should be a starting point to other more advanced courses like Mobile Computing, Network Security, Parallel and Distributed Systems, etc.

• *Principles and practice interact.* Networking is real and many of the design choices that involve networks also depend on practical constraints. Students should be exposed to these practical constraints by experimenting with networking, using tools, and writing networked software.

Course Learning Objectives:

1 To introduce concepts and fundamentals of data communication and computer networks.

2 To explore the inter-working of various layers of OSI.

3 To explore the issues and challenges of protocols design while delving into TCP/IP protocol suite.

4 To assess the strengths and weaknesses of various routing algorithms.

5 To understand various transport layer and application layer protocols.

Prerequisites: None

Class/Laboratory Schedule: CSC 503, CSL 502

Timetabled work in hours per week			Total Credits	Examination Scheme			
Lecture	Practical	Tutorial		Internal Assessment	Term Work	Semester End Examination	Practical/Oral
3	2	Nil	4 + 1	2 X1 Hour tests **(20 M)**	**25 M**	3 hours **(80 M)**	2 hrs **(25 M)**
Total Credits : **5**				Total : **150 M**			

Course Outcomes:

Upon successful completion of this course students will be able to:

CSC503.1	*Comprehend the design issues and enumerate the functions of the different layers of Network Software Models.* **(B2 – Comprehension)**
CSC503.2	*Identify the characteristics of network devices and media used to design network.* **(B2 – Comprehension)**
CSC503.3	Analyze the design issues of DLL, NL, and Transport Layer **(B3 – Analysis)**
CSC503.4	Compare the state-of-the-art network protocols in Data Link Layer, Network Layer and Transport Layer **(B3 – Analysis)**
CSC503.5	*Explore protocols at application layer* **(B2 – Comprehension)**

Relationship of course outcomes with program outcomes: Indicate 1 (low importance), 2 (Moderate Importance) or 3 (High Importance) in respective mapping cell.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2									2
CO2	1	3										
CO3	3	3	2									
CO4	2	3										2
CO5	3	2										2
Course	3	3	2									2

CO-PSO Relevance Mapping - None

Justification of CO to PO mapping

CSC503.1	*Comprehend the design issues and enumerate the functions of the different layers of Network Software Models*	
	PO1	Knowledge of basic principles of Communication, Translates theory into engineering applications
	PO2	Provides Engineering solutions to some complex communication problems which is efficient and cost effective, Integrates the knowledge of various researches
	PO12	Gain ability to be prepared for life-long learning in the broadest context of technological changes, acquires self-learning from hands-on experience
	Delivery Methods	UT1, Presentations, Practical Sessions, Quiz 1
	Target	2.6
CSC503.2	*Identify the characteristics of network devices and media used to design network*	
	PO1	Learn the criteria, and constraints required for designing a complex network
	PO2	Gain knowledge and differentiate the different alternatives for creating a complex communication system by combining knowledge and strategies to solve problems. Investigates the impact of integrating devices and components into a system.
	Tools	UT1, Lectures, Presentations, Practical Sessions (Simulations)
	Target	2.6
CSC503.3	Analyze the design issues of DLL, NL, and Transport Layer	
	PO1	Finding an Engineering solution to practical problems, Shows appropriate engineering interpretation of mathematical and scientific terms, Analyses the communication process by mathematical computations
	PO2	Demonstrate understanding of how various pieces of the problem relate to each other and the whole. Relates theoretical concepts to practical problem solving, uses appropriate resources to locate information needed to find optimal solutions.

	PO3	Compares and assist to select a promising approach as per criteria, analysis and constraints Design solutions by developing components and algorithms suitable as per the scale of a network
	Tools	UT2, Lectures, Problem solving in class, Assignments
	Target	2.6
CSC503.4	Compare the state-of-the-art network protocols in Data Link Layer, Network Layer and Transport Layer	
	PO1	Demonstrate an understanding of basic principles of communication engineering, combines mathematical and/or scientific principles and algorithms to formulate models of devices, processes and systems relevant to communication issues.
	PO2	Specialized solutions to some complex design issues of networks. Uses appropriate resources to locate information needed to solve problems
	PO12	Recognize the need for appropriate resources to locate information needed to solve problems. familiar with the current events, discipline, and applications using Computer Networks
	Tools	UT2, Lectures, Presentations, Practical Sessions, Seminars
	Target	2.6
CSC503.5	*Explore protocols at application layer*	
	PO1	Explore all relevant engineering solutions and the interpretations of user requirements. Combines scientific principles to formulate models of processes and systems relevant to communication applications.
	PO2	Formulate solutions considering the several design issues. Compare and analyse the different protocols.
	PO12	Design solutions by developing/modifying components and processes.
	Tools	Seminars, Quiz, Lectures, Presentations, Demos
	Target	2.6

Modes of delivery

Modes of Delivery	**Brief description of content delivered**	**Attained COs**	**Attained POs**
Class room lectures and Presentations	All modules	ALL	PO1, PO2, PO3, PO12
Lab Experiments	Modules 3,4	CO2, CO3	PO1, PO2, PO3
Students' presentations	Module 6	CO5	PO1, PO10
Case Study	Email, Https	CO5	

CO Assessment Tools:

Course Outcome	***Assessment Method***								
	Direct Method (80 %)								***Indirect Method (20%)***
	Unit Tests		Assignments				SEE	Quiz	Course exit survey
	1	2	1	2	3	4			
CO1	30%		20%				30%	20%	100%
CO2	30%			20%			30%	20%	100%
CO3		30%					30%	20%	100%
CO4		30%			30%		30%	20%	100%
CO5		30%				30%	30%	20%	100%

Assignments:

Four assignments will be given on completion the modules as follows:

Assignment No.1	On completion of the 1st module
Assignment No.2	On completion of 2nd and 3rd module
Assignment No.3	On completion of the 4th module
Assignment No.4	On completion of 5th and 6th module

Rubrics for Assignment Grading:

Indicator				
Timeline (2)		More than one session late (0)	One sessions late (1)	On time (2)
Level of content (4)	Just Managed (1)	Major points are addressed minimally (2)	Only major topics are covered(3)	Most major and some minor criteria are included. Information is Adequate (4)
Reading and Understanding (4)	Just Managed (1)	Superficial at most (2)	Understood concepts but no related topics (3)	Understood concepts and related topics (4)

Laboratory Experiment

Total ten number of laboratory experiments will be performed in the practical session as per the time schedule in the time table.

Rubrics for Laboratory Experiment Grading:

Indicator				
Timeline (3)	More than two sessions late (0)	Two sessions late (1)	One sessions late (2)	On time (3)
Knowledge (4)	Not adequate (1)	Superficial at most (2)	Understood concepts but no related topics (3)	Understood concepts and working (4)
skill (3)	Just Managed (1)	Just Managed (1)	Few steps are not appropriate (2)	Structured and optimum performance (3)

Lesson Plan

Teacher-in-Charge: Merly Thomas P

Class	***TE (Computer Engineering) Semester V Div B***		
Academic term	**July-November 2022**		
Course	***Computer Networks***		
Course Code	***CSC503***		
No of Students	***71***		
Periods (Hours) per week	***Lecture***	***3***	
	Practical	***2***	
	Tutorial	*--*	
Evaluation System		***Hours***	***Marks***
	Theory examination	3	80
	Internal Assessment	1+1	20
	Practical/Oral Examination	2 hrs	25
	Term work	--	25
	Total	--	150

Time Table ***(Theory)***	***Day***	***Time***
	Monday	11.20-12.20 pm
	Tuesday	1.30 – 2.30 pm
	Friday	8.45-9.45AM

Course Content and Lesson plan: ***Computer Networks (Theory)***					
Module 1: **Introduction**					
	Lecture No.	**Date**		**Topic**	**Remarks(If any)**
		Planned	**Actual**		
1		25/07/2022	25/07/2022	History and development of computer network, network applications	
2		26/07/2022	26/07/2022	Network software and hardware components, topology	
3		28/07/2022	28/07/2022	Protocol hierarchies, design issues for the layers	
4		29/07/2022	29/07/2022	connection oriented and connectionless services	
5		1/08/2022	1/08/2022	Reference models: layer details of OSI, TCP/IP	
6		3/08/2022	4/08/2022	Reference models: layer details of OSI, TCP/IP	
7		4/08/2022	5/08/2022	Communication between layers	Quiz
Module 2 : **Physical Layer**					
8		8/8/2022	8/8/2022	Guided Transmission Media: Twisted pair, Coaxial	
9		10/8/2022	10/8/2022	Guided Transmission Media: Twisted pair, Coaxial	
10		10/07/2022	11/07/2022	Guided Transmission Media: Fiber Optics	
11		11/08/2022	11/08/2022	Unguided media (Wireless Transmission): Radio Waves	
12		12/08/2022	12/08/2022	Unguided media (Wireless Transmission): Bluetooth	
13		13/08/2022	12/08/2022	Unguided media (Wireless Transmission): Infrared, Virtual LAN	
Module 3: **Data Link Layer**					
14		18/08/2022	18/08/2022	DDL Design Issues, Functionalities of DLL, Framing	

15		22/08/2022	22/08/2022	Flow control algorithms – Sliding Window, Stop & wait	
16		25/08/2022	25/08/2022	Error Detection & Correction techniques	
17		25/08/2022	24/08/2022	HDLC, PPP,	
Module 3.1 **MAC Sublayer**					
17		26/08/2022	26/08/2022	MAC Layer - Aloha protocols, Control Access Protocol	
19		29/08/2022	29/08/2022	MAC Layer - Aloha protocols,	
20		08/09/2022	08/09/2022	Control Access Protocol Carrier Sense Multiple Access (CSMA)	
21		10/09/2022	10/09/2022 01/09/2022	Ethernet, Local Area Networks Ethernet – 802.3 Protocols IP Addressing, Subnetting, IPv4, IPv6	30/09/22 31/09/22
		06/09/2022			**Unit Test I**
Module 4: **Network layer**					
22		12/09/2022	12/09/2022	Introduction. Routing algorithms :	
23		15/09/2022	15/09/2022	Distance Vector Routing, Link state routing	Holiday declared on 05/09/2022
24		16/09/2022		ARP, RARP, ICMP	08/09/2022 Debate
25		19/09/2022	16/09/2022	Routing protocols RIP, OSPF, BGP, IGRP	
26		20/09/2022	19/09/2022	Congestion control algorithms: Open Loop congestion	
27		22/09/2022	20/09/2022 22/09/2022	Congestion control algorithms: Closed Loop congestion	
Module 5: **Transport layer**					
28		23/09/2022	23/09/2022	The Transport Service: Transport service primitives	
29		26/09/2022	23/09/2022	Berkeley Sockets	
30		29/09/2022	29/09/2022	Connection management, UDP, TCP	

31		30/09/2022	30/09/2022	Socket Programming examples	
32		03/10/2022	03/10/2022	TCP & UDP Headers, TCP Flow control	
33		03/10/2022	03/10/2022	TCP Congestion Control, Multiplexing	
Module 6: **Application Layer**					
34		06/10/2022	06/10/2022	DNS, HTTP	
35		08/10/2022	06/10/2022	Email, SMTP	08/10/2022 CRMD
36		10/10/2022	06/10/2022	Telnet, FTP	Seminar
37		06/10/2022	06/10/2022	SNMP Concepts	
38		11/10/2022	11/10/2022	SEMINAR – Satellite Communications	
		18/10/2022			**Unit Test II**
39		14/10/2022		SNMP Format, Messages	
		15/10/2022	15/10/2022	Management Components	
40		20/10/2022	15/10/2022	SEMINAR – ARP, RARP	
		24/10/2022	20/10/2022	SEMINAR – Satellite Communications	