Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-5 (B.Tech.)

Subject: Computer Networks-BETCE15315

Type of course: Professional Core and Professional Elective Courses

Prerequisite: Basic understanding of computer science, programming, data structures, and operating systems.

Rationale:

Modern communication relies heavily on computer networks, which facilitate smooth data transfer between systems and devices. Designing effective, scalable, and secure infrastructures that are essential for the Internet, cloud computing, IoT, and cybersecurity requires an understanding of networking basics. Students gain useful abilities to diagnose, optimize, and innovate in real-world situations by studying network architecture, protocols, routing, switching, and security procedures. Additionally, network knowledge improves technical proficiency, critical thinking, and problem-solving skills, qualifying students for jobs in cloud computing, cybersecurity, network administration, and IT infrastructure management.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-ClassRoom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination: MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No	Course content	Hrs.	% Weightage
1	**Introduction to Networking and Communication Systems:** Understanding Network Fundamentals and the Internet, Overview of the Network Edge and its Components, Core Network Concepts and Architecture, Analyzing Delay, Loss, and Throughput in Packet-Switched Systems, Protocol Layers and Network Service Models Explained, A Historical Overview of Computer Network Development.	06	15%
2	**Software Application Layer:** Fundamentals of Computer Software, Web Technologies and HTTP Protocol, Email Communication and Protocols, Understanding DNS and Domain Resolution, Client-Server Programming with TCP and UDP.	09	20%
3	**Transport Protocol Layer:** Overview of Transport Layer Services, Multiplexing Techniques in Networking, Introduction to Connectionless Transport Protocols, Techniques for Reliable Data Transmission, Fundamentals of TCP and Reliable Connections, Controlling Congestion in Networks, TCP Congestion Handling and Flow Control.	12	25%
4	**Network Routing and Addressing Layer:** Overview of Packet Forwarding and Routing, Types of Network Service Models, Comparing Virtual Networks and Datagram Networks, Exploring Router Mechanisms in Networking, IP Protocol Basics and Internet Addressing, Network Routing Algorithms, Broadcasting and Multicasting in Routing.	12	25%
5	**Data Link and Access Layer:** Overview of Link Layer Functions, Data Integrity: Error Detection and Correction, Multiple Access Techniques in Communication, Network Addressing Concepts, Ethernet Standards and Architecture, Ethernet Switching and Network Devices, Understanding VLANs and Network Segmentation.	06	15%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**VirtuNet: Visualizing Network Designs:** Each student will individually use online tools such as Lucidchart, Cisco Packet Tracer, or Draw.io to design and visualize different computer network topologies (Bus, Star, Ring, Mesh, Hybrid). They will experiment with how different topologies impact data flow, redundancy, and scalability and upload their work on the GMIU portal.	10
2	**PacketRescue: Solving Live Network Challenges:** Students will individually apply their networking knowledge to solve real-life network problems provided by faculty members. Using Cisco Packet Tracer, they will design, configure, troubleshoot, and optimize networks based on given scenarios. The final simulation files and analysis reports will be uploaded to the GMIU portal.	10
3	**PathFinder: Dynamic & Static Routing in Action:** Students will individually use Cisco Packet Tracer to simulate and analyze network routing algorithms such as Static Routing, RIP, OSPF, and EIGRP. They will observe how different routing techniques impact network performance, efficiency, and fault tolerance. The final simulation files and analysis reports will be uploaded to the GMIU portal.	10
	Total	30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	25%	35%	20%	10%	05%	05%

Course Outcome:

	After learning the course, the students should be able to:
CO1	Understand the fundamentals of computer networks.
CO2	Evaluate network performance through delay, loss, and throughput analysis.
CO3	Demonstrate proficiency in software application layer protocols such as HTTP, DNS, and email communication.
CO4	Apply transport layer concepts like TCP/UDP, congestion control, and reliability.
CO5	Implement and assess routing, addressing, link layer protocols, and VLAN segmentation.

List of Practical:

Sr. No	Description	Unit No	Hrs.
1	Implement different LAN topologies using Cisco Packet Tracer.	1	2
2	Study about OSI model and TCP IP model.	1	2
3	Study different types of network cables and practically implement the cross-wired cable and straight through cable using a crimping tool.	1	4
4	Study and Test various Network devices available at Department/Institute. (Repeater, Hub, Switch, Bridge, Router and Gateway).	5	3
5	Study about TCP and UDP Protocols.	3	2
6	Study of basic network command and Network configuration commands.	4	4
7	Determine whether the following IPv4 addresses are valid or invalid. If valid IPv4 address then find class, Network and Host ID of an IPv4 address. If invalid IPv4 address then write a reason for the same. (i)1.4.5.5 (ii)75.45.301.14 (iii)111.56.045.78 (iv)192.226.12.11 (v)130.45.151.154 (vi)11100010.23.14.67	4	2
8	Explore Wireshark.	5	3
9	Capturing network traffic using Wireshark.	5	4
10	Analyze basic protocols like HTTP, DNS, and SMTP to understand how data is transmitted and received using Wireshark.	2	4
		Total	30

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

Practical examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

Reference Books:

[1] Computer Networks by Andrew S. Tanenbaum and David J. Wetherall.
[2] Data and Computer Communications by William Stallings.
[3] Computer Networking: A Top-Down Approach by James F. Kurose and Keith W. Ross.
[4] Network+ Guide to Managing and Troubleshooting Networks by Mike Meyers.
[5] Computer Networks and Internets by Douglas E. Comer.
[6] Networking: A Beginner's Guide by Bruce Hallberg.