Gyanmanjari
Innovative University

Subject: Data Communication and Networking - BETEC14305

Type of course: Professional Elective

Prerequisite: Knowledge of computer networks and Devices.

Rationale: This course covers essential networking concepts, including OSI/TCP-IP models, data transmission, network devices, IP addressing, routing, switching, and basic security. Through simulations and simple network setups, students learn how data moves across networks and gain skills to design and troubleshoot small networks.

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:

Unit No.	Course content	Hrs	% Weight age
1	**Networking Fundamentals** Definition, need of computer network, use of network, network components, data flow, types of connection, network topology, servers. OSI model, Physical Layer, Data Link Layer , Network Layer, Transport Layer, Session Layer, Presentation Layer, Application Layer, TCP/IP model, ARP protocol, difference of OSI model and TCP/IP model.	5	10%

2	**Physical Layer & Data Link Layer** Introduction of physical layer, transmission media, twisted pair cable, coaxial cable, fiber optics cable, Data link layer functions, framing, Character count, Flag bytes with byte stuffing, error control, Go-Back-N ARQ, Selective Repeat ARQ, Elementary Data Link Layer Protocols, noisy channel, Sliding window protocols: simplest protocol and sliding window protocol, types of error, Error Detection, Error Correction,	9	20%
3	**Network Layer** Network devices, Repeaters, Bridges, Switches, hub, routers, gateways, access point, protocol: IPV4, IPV6, difference between IPV6 & IPV4.	9	20%
4	**Transport Layer and Session Layer** Transport Layer: function of transport layer, transport layer header, connection management, error control and flow control, multiplexing, time management, cash recovery, TCP, session layer introduction, responsibility of session layer.	9	20%
5	**Presentation Layer and Application Layer** Introduction of presentation layer, introduction of application layer, Applications layer function, communication types, domain name system, SMTP, FTP, POP, HTTP, Communication service, application service, VPN and its types.	9	20%
6	**Network Security** introduction, network security layers, types of network security, viruses and its types, worms, firewall - need, advantages and disadvantages.	4	10%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Real-World Applications of Computer Networks** Students shall study any real-world computer network application based on its network architecture, communication protocols, data transmission methods, security mechanisms, scalability, performance, and real-world use cases, and submit the detailed report on the GMIU Web Portal.	10
2	**LAN/ WAN Setup :** Students will design & demonstrate a Small LAN/WAN Setup using Networking Devices (Switch, Router, Access Point, etc) and upload the report on the GMIU web portal.	10
3	**Case Study on Network Security and Cyber Threats:** Students will study and present a case on recent network security attacks (e.g., DDoS, phishing, ransomware, etc) and make a presentation and upload it on the GMIU web 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	30%	40%	05%	05%	20%	0%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand network basics and explain OSI/TCP-IP models.
CO2	Describe various transmission media and apply appropriate error detection and correction techniques
CO3	Identify and explain the functions of network devices and their roles in data communication
CO4	Explore transport and session layer protocols used in computer network
CO5	Demonstrate familiarity with presentation and application layer protocols, and their importance in real-time communication
CO6	Develop a basic understanding and awareness of network security concepts and related issues

List of Practical:

Sr. No.	Description	Unit No.	Hrs
1	Study of network components, types of connections, and topologies (Bus, Star, Ring, Mesh).	1	2
2	Create a simple peer-to-peer network between two PCs and test connectivity using ping.	1	2
3	Design a 3-PC star topology using a switch and assign static IPs.	1	2
4	Demonstrate data flow and OSI layers using Packet Tracer's simulation mode.	1	2
5	Study and testing of transmission media: twisted pair, coaxial, and fiber optic cables.	2	2

6	Create a small LAN and test data encapsulation and error detection using simulation view.	2	2
7	Study and configuration of network devices: hub, switch, router, repeater, bridge, and gateway.	3	2
8	Configure RIP dynamic routing between three routers.	3	2
9	Configure OSPF dynamic routing for a multi-router topology.	3	2
10	Demonstrate connection management and flow control in a TCP network using a simulator.	4	2
11	Simulate a TCP connection and observe connection establishment (three-way handshake).	4	2
12	Study and analyze application layer protocols (DNS, HTTP, FTP, SMTP, POP3) using Wireshark.	5	2
13	Configure a web server (HTTP) and client PC to demonstrate webpage access.	5	2
14	Configure DNS and FTP servers and demonstrate file upload/download.	5	2
15	To study and understand the importance of securing network infrastructure.	6	2
	Total		30

Instructional Method:

The course delivery method will depend on the content requirements and the students' needs. The teacher, in addition to conventional teaching methods using the blackboard, may also use various tools such as demonstrations, role-playing, Quizzes, brainstorming, and MOOCs.

From the content, 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, and Virtual Laboratory The internal evaluation will be done based on the Active Learning Assignment.

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

Reference Books:

[1] Kurose James F, Computer Networking, Pearson.
[2] Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill.
[3] Larry L.Peterson., Computer Networks, ELSEVIER.