GANPAT UNIVERSITY

FACULTY OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications	**Branch/Spec.**	Computer Applications
Semester	I	**Version**	1.0.0.0
Effective from Academic Year	2026-27	**Effective for the batch Admitted in**	July 2026
Subject Code	**P11A3ACN**	**Subject Name**	Advanced Computer Networks

Teaching scheme						**Examination scheme (Marks)**			
(Per week)	**Lecture (DT)**		**Practical (Lab.)**		**Total**		**CE**	**SEE**	**Total**
	L	TU	P	TW		Theory	40	60	100
Credit	3	-	1	-	4	Practical	20	30	50
Hours	3	-	2	-	5				

Objective:

This course covers network performance optimization using TCP/UDP/TLS, energy-efficient wireless/mobile architectures, and modern web protocols (HTTP/1.x to HTTP/3, WebRTC, APIs) to build scalable, low-latency, real-time applications.

Pre-requisites:

Basice Understanding of computer networks, internet and computer skills.

Course Outcomes :

Name of CO	**Description**
CO1	Explain the basic concepts of latency, bandwidth, and TCP protocols.
CO2	Explain the working of UDP and TLS for secure and efficient communication.
CO3	Describe the architecture, performance, and optimization of WiFi and mobile networks.
CO4	Apply network and application optimization techniques and understand the evolution of HTTP protocols.

	Mapping of CO and PO							
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2	-	-	1	2
CO2	3	3	2	3	-	-	3	2
CO3	3	3	3	3	1	-	2	3
CO4	3	3	3	3	1	1	2	3

Contents		
Unit	**SECTION-I**	**Hrs**
1	**Latency, Bandwidth & TCP :**Primer on Latency and Bandwidth: Speed Is a Feature; The Many Components of Latency; Speed of Light and Propagation Latency; Last-Mile Latency; Bandwidth in Core Networks; Bandwidth at the Network Edge; Delivering Higher Bandwidth and Lower Latencies; **Building Blocks of TCP:** Three-Way Handshake; Congestion Avoidance and Control; Bandwidth-Delay Product; Head-of-Line Blocking; Optimizing for TCP	**11**
2	**Building Blocks of UDP:** Null Protocol Services; UDP and Network Address Translators; Optimizing for UDP. **Transport Layer Security (TLS):** Encryption, Authentication, and Integrity; HTTPS Everywhere; TLS Handshake; TLS Session Resumption; Chain of Trust and Certificate Authorities; Certificate Revocation; TLS Record Protocol; Optimizing for TLS; Testing and Verification. **Introduction to Wireless Networks:** Ubiquitous Connectivity; Types of Wireless Networks; Performance Fundamentals of Wireless Networks; Measuring Real-World Wireless Performance	**12**
	SECTION-II	
3	**WiFi:** From Ethernet to a Wireless LAN; WiFi Standards and Features; Measuring and Optimizing WiFi Performance; Optimizing for WiFi Networks. **Mobile Networks:** Brief History of the G's; Device Features and Capabilities; Radio Resource Controller (RRC); End-to-End Carrier Architecture; Packet Flow in a Mobile Network; Heterogeneous Networks (HetNets); Real-World 3G, 4G, and WiFi Performance	**11**
4	**Optimizing for Mobile Networks:** Preserve Battery Power; Eliminate Periodic and Inefficient Data Transfers; Anticipate Network Latency Overhead; Design for Variable Network Interface Availability; Burst Your Data and Return to Idle; Offload to WiFi Networks. **Apply Protocol and Application Best Practices. Brief History of HTTP:** HTTP 0.9: The One-Line Protocol; HTTP/1.0: Rapid Growth and Informational RFC; HTTP/1.1: Internet Standard; HTTP/2: Improving Transport Performance	**11**

Practical Content: List of programs specified by the subject teacher based on above mentioned topic.
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Text Books/Reference Books:	
1	Ilya Grigorik, "High-Performance Browser Networking", 2013: First Edition, O'Reilly
2	Behrouz A. Forouzan, "TCP/IP Protocol Suite", 4th Edition, McGraw-Hill
3	Douglas E. Comer, "Internetworking with TCP/IP - (Vol. 1) Principles, Protocols, and Architecture", 6th Edition, Prentice Hall of India (PHI) Publishers.
4	Chris Sanders, "Practical Packet Analysis using Wireshark to solve real world problems", No Starch Press, Inc.

Web References / MOOC / Certification Course	
1	MDN Web Docs (Fetch API, WebSockets, & Server-Sent Events): https://developer.mozilla.org/
2	WebRTC.org (Official WebRTC Guide & Protocols): https://webrtc.org/
3	Cloudflare Learning Center (QUIC, HTTP/3, and TLS 1.3 Architecture):
4	NPTEL / SWAYAM: *Advanced Computer Networks* (IIT Kharagpur)
5	Coursera (Google): *The Bits and Bytes of Networking*

6	Coursera (University of Illinois): *Cloud Networking & Real-Time Communications*
7	edX (Curtin University): *Fundamentals of Computer Networking*

Question Paper Scheme:

University Examination Duration: 3 Hours

Note for Examiner: -

(I) Questions 1 and 4 are compulsory with no options.

(II) Internal options should be given in questions 2, 3, 5 and 6.

SECTION – I

Q.1 –8 Marks

Q.2 –11 Marks

Q.3 –11 Marks

SECTION - II

Q.4 –8 Marks

Q.5 –11 Marks

Q.6 –11 Marks