CO5	Explore advanced topics and emerging trends in distributed and cloud computing, preparing for future challenges in the field.

S. NO	Contents	Contact Hours
UNIT 1	**Unit 1: Introduction to Distributed Systems** Overview of Distributed Computing: Definitions, Characteristics, and Applications Distributed System Architectures: Client-Server, Peer-to-Peer, and Hybrid Models Communication in Distributed Systems: RPC, RMI, and Message Passing Synchronization in Distributed Systems: Clock Synchronization, Logical Clocks, and Distributed Mutual Exclusion Fault Tolerance and Recovery in Distributed Systems: Checkpointing, Replication, and Consensus Algorithms	**10**
UNIT 2	**Unit II: Introduction to Cloud Computing** Overview of Cloud Computing: Definitions, Characteristics, and Service Models (IaaS, PaaS, SaaS) Cloud Deployment Models: Public, Private, Hybrid, and Community Clouds Virtualization in Cloud Computing: Concepts, Hypervisors, and Virtual Machine Management Cloud Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) Economic and Business Models of Cloud Computing: Cost-Benefit Analysis, Pricing Models, and SLA Management	**12**
UNIT 3	**Unit III: Distributed Algorithms and Middleware** Distributed Algorithms: Leader Election, Consensus Algorithms (Paxos, Raft), and Distributed Hash Tables (DHTs) Middleware for Distributed Systems: Definition, Components, and Examples Data Consistency and Replication in Distributed Systems: CAP Theorem, Consistency Models, and Quorum-Based Protocols Security in Distributed Systems: Threats, Encryption, and Authentication Mechanisms Case Studies: Middleware Platforms (CORBA, Java RMI, Microsoft DCOM) and their Applications.	**10**
UNIT 4	**Unit IV: Cloud Architecture and Storage** Cloud Architecture: Cloud Infrastructure, Resource Management, and Virtualization Cloud Storage: Data Storage Systems in Cloud, Distributed File Systems (HDFS, GFS), and NoSQL Databases Cloud Security: Security Issues, Data Protection, and Identity and Access Management (IAM) Cloud Application Development: Tools, Frameworks, and Best Practices Case Studies: Amazon Web Services (AWS), Google Cloud Platform (GCP), Microsoft Azure	**10**

UNIT 5	**Unit V: Advanced Topics in Distributed and Cloud Computing** Edge and Fog Computing: Concepts, Architectures, and Use Cases Serverless Computing: Function as a Service (FaaS) and Event-Driven Architectures Containerization and Orchestration: Docker, Kubernetes, and Microservices Big Data and Cloud Computing: Hadoop, Spark, and Data Analytics in the Cloud Future Trends in Distributed and Cloud Computing: AI Integration, Blockchain, and Quantum Computing	**10**
	TOTAL	**42**