FACULTY OF COMPUTER APPLICATIONS
Bachelor Of Science (Data Science)
B.Sc.(DS)

- **Sem.** : 4
- **Subject Code** : 05DS0403
- **Subject** : Distributed Computing
- **Course Objectives** :

1. Understand the fundamental concepts of Operating System and Computer Network.
2. Understand the fundamental concepts and principles of distributed computing, including distributed systems, architectures, and models.
3. Understand different paradigms used for distributed computing.
4. Explore the challenges and trade-offs involved in IPC, including performance, synchronization, and data consistency.
5. Understand the concept of group communication and its significance in distributed systems.

- **Prerequisites** : Basics of Networking and Operating System

Unit No	Topics Covered	No of lectures required
1	**Operating System and Networking basics** Operating System Definition**,** Concurrency terminologies (Mutual exclusion, Critical Section, Deadlock, livelock), Process and Thread difference. Definition of Computer Network, OSI and TCPIP reference model, Connection oriented and connectionless communication, Protocols (FTP, HTTP, ICMP)	**10**
2	**Distributed Computing** An Introduction, Distributed Systems, Definitions, The History of Distributed Computing, Different Forms of Computing, Strengths and Weaknesses of Distributed Computing, Basics of The Architecture of Distributed Applications	**9**

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3	**Distributed Computing Paradigms** Paradigms and Abstraction, An Example Application, Paradigms for Distributed Applications **The Client-Server Paradigm** Background, Client-Server Paradigm Issues, Iterative Server and Concurrent Server, Stateful Servers	**9**
4	**Inter-process Communications** An Archetypal IPC Program Interface, Event Synchronization, Timeouts and Threading, Deadlocks and Timeouts, Data Representation, Data Encoding, Text-Based Protocols, Request Response Protocols, Event Diagram and Sequence Diagram, Connection-Oriented versus Connectionless IPC	**9**
5	**Group Communication** Unicasting versus Multicasting, An Archetypal Multicast API, Connectionless versus Connection Oriented Multicast, Reliable Multicasting versus Unreliable Multicasting	**8**

Course Outcomes: (Students will be able to)

1. Understand basics of Operating System and Computer Network.
2. Analyze strengths and weaknesses of Distributed Computing.
3. Analyze various distributed computing paradigms.
4. Understand inter process communication interface.
5. Understand the concepts of group communication

Course Outcomes – Program Outcomes Mapping Table :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	H			H		M					H
CO2	H			M				L		L	L
CO3		H		M		M					L
CO4	H			M	L				L	M	
CO5		H		H		L			H	M	

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Text Book :

"Distributed Computing Principles and Applications", M. L. Liu, Pearson Education , 1st Edition.

Reference Books :

1) "Distributed Systems: Computing over Networks", Crichlow, PHI , 2nd Edition

2) "Distributed Systems - Principles and Paradigms", Tanenbaum, Sten, PHI , 2nd Edition

3) "Distributed Systems Architecture - A Middleware Approach", Puder, Science & Technology Books

Web References :

1. **https://www.freecodecamp.org/news/a-thorough-introduction-to-distributed-systems-3b91562c9b3c/**
2. **https://towardsdatascience.com/the-beginners-guide-to-distributed-computing-6d6833796318**
3. **https://www.tutorialspoint.com/Distributed-Systems**

App References :

1. **Simplilearn**
2. **GeeksforGeeks**

Syllabus Coverage from text /reference book & web/app reference:

Unit #	Chapter Numbers
1	1,3
2	2
3	5
4	6
5	7

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Practicals

Sr. No	Command Category
1	Networking Commands – Set1
2	Networking Commands – Set2
3	Networking Commands – Set3
4	Program to implement Network File System
5	Client – Server Application1
6	Client – Server Application2
7	Program1 for Implementation of Remote Procedure Call paradigm
8	Program2 for Implementation of Remote Procedure Call paradigm
9	Program1 for Implementation of Remote Method Invocation paradigm
10	Program2 for Implementation of Remote Method Invocation paradigm
11	Program1 to implement Inter Process Communication1
12	Program2 to implement Inter Process Communication2
13	Program to implement Unicast communication
14	Program to implement Multicast communication
15	Program to implement Group Communication