	National Institute of Technology Meghalaya An Institute of National Importance	**CURRICULUM**

Programme	**Bachelor of Technology in Computer Science and Engineering**	Academic Year of Regulation	**2018-2019**
Department	**Computer Science and Engineering**	Semester	**VIII**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
CS 424	**Distributed Computing**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	Course Outcomes		
This course explains the advantages and challenges in designing distributed operating system, algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc.		CO1	**Able to describe the fundamental components of distributed operating system such as algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc**
This course describes the details of distributed computing techniques, synchronous and processes, minimum spinning tree and communication protocol algorithms.		CO2	**Able to design and demonstrate the distributed computing techniques for process synchronization and construction of minimum spinning tree for message forwarding and receiving.**
This course provides the methodologies to design and implement distributed mutual exclusion algorithm and distributed deadlock detection and termination algorithms		CO3	**Able to develop the practical understanding of Distributed mutual exclusion and deadlock detection for various processes.**
This course provides the techniques to design and develop applications based on requirements of various fault tolerance system, algorithm for failure recovery and fault tolerance in distributed systems.		CO4	**Able to design and analyse the fault tolerant system to achieve high reliability and accuracy using the principle of fault tolerant algorithms.**
		CO5	**Able to develop, analyse and evaluate the failures and failure recovery algorithm to recover the system.**

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**3**
2	CO2	**3**	**3**	**3**	**1**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**2**	**3**	**2**
3	CO3	**1**	**2**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
4	CO4	**1**	**2**	**3**	**3**	**3**	**2**	**3**	**-**	**2**	**-**	**-**	**1**	**2**	**3**	**2**
5	CO5	**2**	**3**	**3**	**2**	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**1**	**3**	**3**	**3**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction: Distributed System, Theoretical Foundations of Distributed Systems, Operating system and types, Distributed Computing Model, Characteristics, and Issues.**	**04**	**CO1** **CO2**
II	**Wave and Traversal Algorithms: Echo Algorithm, Sequential Polling, Awerbuch's DFS Algorithm, Cidon's DFS Algorithm.**	**04**	**CO1** **CO2**
III	**Minimal Spanning Tree Algorithms: Gallager-Humblet-spira Algorithm, Testing the edge optimization, Reorientation of tree**	**04**	**CO2** **CO3**
IV	**Communication Protocol and Routing Algorithm: Balanced Sliding Window Protocol, Ordering, Communication Protocols, Agreement Protocols, Commit Protocols, Leader Election Algorithms. Properties, Routing Algorithms, Destination based forwarding, Toueg's observation, Candy-Mishra and The Netchange Algorithms.**	**05**	**CO3** **CO4**
V	**Deadlock Free Packet Switching: Deadlock free packet: Model, Buffer graph, Requirements and Destination Schemes, Switching, Logical Clocks and Causal, Framework and implementation**	**05**	**CO4** **CO5**
VI	**Distributed Mutual Exclusion and Algorithms: Distributed Mutual Exclusion Lamport's algorithm, Ricart–Agrawala algorithm, Singhal's dynamic information-structure algorithm, Lodha and Kshemkalyani's fair mutual exclusion algorithm, Quorum-based mutual exclusion algorithms, Maekawa's algorithm**	**06**	**CO3** **CO4**
VII	**Distributed Deadlock Detection and Termination Algorithms: System model, Preliminaries, Models of deadlocks, Knapp's classification of distributed deadlock detection, algorithms,**	**04**	**CO5**
VIII	**Failure Recovery and Fault tolerance in distributed systems: Unreliable failure detectors, The consensus problem, Atomic broadcast, A solution to atomic broadcast, The weakest failure detectors to solve fundamental agreement problems, An implementation of a failure detector, An adaptive failure detection protocol. Distributed File System (DFS), Distributed Shared Memory**	**04**	**CO4** **CO5**
	Total	**36**	

Essential Readings

1. A S Tanenbaum & Martin Steen, Distributed Systems: Principles and Paradigms, 2/E,PHI, 2006.
2. Colouris, Dollimore, Kindberg, Distributed Systems Concepts & Design, 4/ E Pearson, 2005.
3. G. Tel, "Introduction to Distributed Algorithms", 2/E Cambridge University Press,2012.

Supplementary Readings

1. Ajay D. Kshemkalyani and Mukesh Singhal "Distributed System; Principles, Algorithms, Systems 1/E, Cambridge University Press, 2010
2. S. Ghosh, "Distributed Algorithms, An Algorithmic Approach", Chapman and Hall, 1/E,2006.
3. P. K. Sinha , "Distributed Operating Systems –Concepts and Design", IEEE CS Press, 2/E, PHI,2007