

Branch Name:	Computer Engineering (Software Engineering)
Program Code:	ET203
Course Title:	Distributed Computing
Course Code:	2ET2030103T
Pre-requisite Course:	Fundamentals of Operating Systems and Computer Networks

Course Objective:

The objectives of this course are:

- To provide students with contemporary knowledge in distributed computing.
- To describe the various design issues in a distributed computing systems.
- To provide knowledge on principles and practice underlying in the design of distributed systems.
- To equip students with skills to design a distributed application.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Unit No	Topics	Total Hours	Weightage (%)
1	Introduction to Distributed Computing: Definition, Different forms of computing, Relation to parallel systems, Strengths and weaknesses of Distributed Computing, A Model of distributed computations	02	08
2	Message Passing: Inter process Communication(IPC), Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.	02	08
3	Remote Procedure Calls: The Remote Procedure Call (RPC) Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling. Arguments and Results, Server Management, Communication Protocols for RPCs, Complicated RPCs.	03	14
4	Distributed Objects and Remote Invocation : Introduction, Communication between distributed objects, Java RMI, CORBA	02	08
5	Distributed Shared Memory: Design and Implementation issues of Distributed Shared Memory (DSM), Granularity, Structure of Shared memory Space, Consistency Models, replacement Strategy, Thrashing, Advantages of DSM.	03	14
6	Synchronization: Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms.	03	12
7	Resource and Process Management: Desirable Features of a good global scheduling algorithm, Task assignment approach, Load Balancing approach, Load Sharing Approach, Process Migration	04	16

8	Distributed Transactions: Introduction, Flat and nested distributed transactions, Two-phase commit protocol, Concurrency control in distributed transactions	03	12
9	Security in distributed computing and application: Security threats, security mechanism, security policies, case study of Globus security architecture	02	08

Reference Books:

- Distributed Operating Systems Concepts and Design by Pradeep K. Sinha (PHI)
- Distributed Systems Concepts and Design Fifth Edition George Coulouris, Jean Dollimore and Tim Kindberg, Addison-Wesley Inc./Pearson Education
- Distributed Computing – Principles and Applications, by M. L. Liu (Pearson)
- Distributed Systems Principles and Paradigms by Andrew S. Tanenbaum and Maarten Van Steen (PHI)
- Distributed Computing: Principles, Algorithms, and Systems, Ajay Kshemkalyani and Mukesh Singhal

List of Open-Source Software/learning website:

- <https://www.cs.uic.edu/~ajayk/DCS-Book>
- <http://cs-www.cs.yale.edu/homes/aspnes/classes/465/notes.pdf>
- <http://nptel.ac.in/courses/106106107/>

Course Learning Outcomes (CLO):

Course Outcomes	Description	Bloom's Taxonomy Level
COL1	Analyze various components of distributed computing systems	Understanding (1) Applying (1)
COL2	classify distributed shared memory models	Applying (1)
COL3	analyze algorithms for coordination, communication, synchronization in distributed systems	Applying (3)
COL4	Integrate OS and programming language concepts to solve/implement the (distributed) components of the systems	Applying (2)

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M		M											
CLO2	H	M			M							L				
CLO3	H	M	M		M											
CLO4	M	M	M		M							L				
CLO5	M	M										L				

H: High, M: Medium, L: Low