JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTER, Jaipur	
Department	**Information Technology**
Subject taught	**Distributed System 6IT4-06**

Vision of College

Vision To become a renowned centre of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

Mission of the college

- Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.
- Identify, based on informed perception of Indian, regional and global needs, areas of focus and provide platform to gain knowledge and solutions.
- Offer opportunities for interaction between academia and industry.
- Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

Vision of the Department

"The vision of our institute is to provide the professional and active learners to the IT challenging world. By providing the technical surroundings and scientific excellence environment, we serve as a valuable resource for industry and society."

Mission of the Department

- To generate the adequate knowledge by promoting the extracurricular activities and technical education.
- To provide the graduates best technology services to fulfill its commitment of technical and education of the highest quality.
- To anticipate and meet the information technology needs of alumni, graduates, faculty and staff as they pursue their educational and professional goals.

Distributed System(6IT4-06)

[L/T/P - 3/0/0]

Class	:	B. Tech. – 6th semester
External marks	:	120
Internal marks	:	30
Total marks	:	150

Course Outcome (CO's):

On completion of this course, students will be able to:

CO1: Understand distributed system concepts and desired properties of such systems
CO2: Understand and analyze the problems and challenges associated with distributed system.
CO3: Apply key distributed system properties and evaluate various distributed systems
CO4: Design and deploy distributed system using various mechanisms

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:
H=3, M=2, L=1.

Sem	Subject	Code	L/T/P	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
VI	Distributed System	6IT4-06	L	1.Understand distributed system concepts and desired properties of such systems	H	M	M	H	-	-	-	-	L	L	M	H
			L	2. Understand and analyze the problems and challenges associated with distributed system.	H	M	M	M	-	-		-	L	L	H	H
			L	3. Apply key distributed system properties and evaluate various distributed systems	H	M	M	M	M	M	-	-	L	L	H	H
			L	4.Design and deploy distributed system using various mechanisms	H	M	M	H	M	M	-	-	L	L	H	H

PROGRAM OUTCOME:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems in IT.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences in IT.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations using IT.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions using IT.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations in IT.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice using IT.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development in IT.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice using IT.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in IT.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage IT projects and in multidisciplinary environments.
12. **Life – long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes needed in IT.

Syllabus:

6IT4-06: Distributed System

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction**: Objective, scope and outcome of the course.	01
2	**Distributed Systems**: Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Centralized Operating System, Network Operating Systems, Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE). Theoretical issues in distributed systems: Notions of time and state, states and events in a distributed system, time, clocks and event precedence, recording the state of distributed systems.	09
3	**Concurrent Processes and Programming**: Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included).Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC and RMI case studies	08
4	**Distributed Process Scheduling**: A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation. Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication. Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems	08
5	**Distributed Shared Memory**: Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems. Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, Modelling a Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection.	08
6	**Distributed Agreement**: Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement. Replicated Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation. CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.	08
	Total	42

Lecture Plan:

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTER			
Department of Information Technology			
LECTURE PLAN			
Subject:6IT4-06: Distributed System			**Year/sem: III/ VI**
No. of Lecture Req./(Avl.) : 41/(42)			
Unit No./ Total lec. Req.	**Topics**	**Lect. Req.**	**Lect. No.**
Unit-1 (9)	Distributed Systems: Features of distributed systems, nodes of a distributed system	1	1
	Distributed computation paradigms, Model of distributed systems	1	2
	Types of Operating systems: Centralized Operating System, Network Operating Systems	1	3
	Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems.	1	4
	Systems Concepts and Architectures: Goals, Transparency, Services,	1	5
	Architecture Models, Distributed Computing Environment (DCE	1	6
	Theoretical issues in distributed systems: Notions of time and state	1	7
	States and events in a distributed system	1	8
	Time, clocks and event precedence, recording the state of distributed systems.	1	9
Unit 2 (8)	Concurrent Processes and Programming: Processes and Threads, Graph Models for Process Representation	1	10
	Client/Server Model, Time Services, Language Mechanisms for Synchronization	1	11
	Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included)	2	
	.Inter-process Communication and Coordination: Message Passing	1	14
	Request/Reply and Transaction Communication	1	15
	Name and Directory services	1	16
	RPC and RMI case studies	1	17
Unit 3 (8)	Distributed Process Scheduling: A System Performance Model, Static Process Scheduling with Communication	1	18
	Dynamic Load Sharing and Balancing	1	19
	Distributed Process Implementation. Distributed File Systems	1	20
	Transparencies and Characteristics of DFS, DFS Design and implementation	1	21
	Transaction Service and Concurrency Control, Data and File Replication.	1	22
	Case studies: Sun network file systems,	1	23
	General Parallel file System and Window's file systems	1	24
	Andrew and Coda File Systems	1	25
Unit-4 (8)	Distributed Shared Memory: Non-Uniform Memory Access Architectures, Memory Consistency Models	1	26
	Multiprocessor Cache Systems, Distributed Shared Memor	1	27
	Implementation of DSM systems	1	28
	Models of Distributed Computation: Preliminaries, Causality	1	29
	Distributed Snapshots, Modelling a Distributed Computation	1	30
	Failures in a Distributed System, Distributed Mutual Exclusion, Election	1	31
	Distributed Deadlock handling	1	32
	Distributed termination detection.	1	33

Unit 5 (8)	Distributed Agreement: Concept of Faults, failure and recovery	1	34
	Byzantine Faults, Adversaries, Byzantine Agreement	2	35-36
	Impossibility of Consensus and Randomized Distributed Agreement.	1	37
	Replicated Data Management: concepts and issues, Database Techniques	1	38
	Atomic Multicast, and Update Propagation	1	39
	CORBA case study: Introduction, Architecture	1	40
	CORBA RMI, CORBA Services.	1	41
Recommended books:			
1. Distributed operating systems and algorithm analysis by Randy Chow and T. Johnson, Pearson			
2. Distributed Systems- concepts and Design, Coulouris G., Dollimore J, and Kindberg T., Pearson			

Slow Learner assignments Co-wise:

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE: B.TECH **SEMESTER: VI** **SECTION: A&B**

SUBJECT : Distributed System **CODE : 6IT4-06**

TIME:1HR. **CO-1 (SESSION: 2019-20)** **MM: 10**

Assignment for weak Student

COURSE OUTCOMES:

CO1: Understand distributed system concepts and desired properties of such systems

Instructions: Attempt all sections

SECTION-A

Attempt all questions **(2x 1=2)**

Q.1In distributed system, each processor has its own _____
a) local memory
b) clock
c) both local memory and clock
d) none of the mentioned

Q.2 What is a common problem found in distributed system?
a) Process Synchronization
b) Communication synchronization
c) Deadlock problem
d) Power failure

SECTION-B

Attempt all questions **(2*1=4)**

Q.3 What is Distributed system? Explain its features differentiate between network OS and distributed OS

Q.4: Define System models and briefly explain about architectural models.

SECTION-C

Attempt all questions **(2*1=4)**

Q.5 Why do you need dynamic load sharing and balancing? Explain

Q.6: What do you mean by Distributed computing environments (DCE).Explain its features and goals.

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE: B.TECH **SEMESTER: VI** **SECTION: A&B**

SUBJECT : Distributed System **CODE : 6IT4-06**

TIME:1HR. **CO-2 (SESSION: 2019-20)** **MM: 10**

Assignment for weak Student

COURSE OUTCOMES:

CO2: Understand and analyze the problems and challenges associated with distributed system.

Instructions: Attempt all sections

SECTION-A

Attempt all questions **(2x 1=2)**

Q.1. Which is not a major component of a file system?
a) Directory service
b) Authorization service
c) Shadow service
d) System service

Q.2What are not the characteristics of a DFS?
a) login transparency and access transparency
b) Files need not contain information about their physical location
c) No Multiplicity of users
d) No Multiplicity if files

SECTION-B

Attempt all questions **(4*1=4)**

Q.3Describe the design issues and implementation of RMI

SECTION-C

Attempt all questions **(4*1=4)**

Q.4 Can a server works as a client and server in a system. Explain?

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE: B.TECH **SEMESTER: VI** **SECTION: A&B**

SUBJECT : Distributed System **CODE : 6IT4-06**

TIME:1 HR. **CO-3 (SESSION: 2019-20)** **MM: 10**

Assignment for weak Student

COURSE OUTCOMES:

CO3: Apply key distributed system properties and evaluate various distributed systems

Instructions: Attempt all sections

SECTION-A **[2*2.5=5]**

Attempt all questions:

Q.1. Explain the requirement of good mutual exclusion algorithm
Q.2 Describe APP Problem?

SECTION-B **[2*2.5=5]**

Attempt all questions:
Q.3 Classify the distributed mutual exclusion algorithms? Discuss in detail how you can measure performance of each of these distributed mutual exclusion algorithm.
Q.4 Describe memory consistency model & multiprocessor cache system.

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE, JAIPUR
DEPARTMENT OF INFORMATION TECHNOLOGY
SESSION - [2019-20]

COURSE: B.Tech. **SEMESTER-VI** **SECTION: A+B**
SUBJECT: Distributed System **CODE: 6IT4-06**
TIME DURATION: 1hour **CO-4 (SESSION: 2019-20)** **MM: 10**

Assignment for weak Student

COURSE OUTCOMES
CO4: Design and deploy distributed system using various mechanisms

Instructions: Attempt All Sections.

SECTION-A **[2*2.5=5]**

Attempt all questions:

Q.1. Differentiate between Fault & Failure?
Q.2 Explain CORBARMI with its services.

SECTION-B **[2*2.5=5]**

Attempt all questions:

Q.3 Explain the Agreement protocols? Discuss the general system model where agreement protocols are used.

Q.4 Write the need of Update propagation in replica data management? Explain.