DISCIPLINE SPECIFIC ELECTIVE COURSE: Distributed Algorithms

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSE8d: Distributed Algorithms	**4**	**3**	**0**	**1**	Pass in Class XII	Data Structures, Design and Analysis of Algorithms

Course Objective

The course introduces the students to distributed algorithms in synchronous and asynchronous network models. The course would give the students hands-on practice to write programs for distributed algorithms using Remote Procedure Call (RPC) or Message Passing Interface (MPI)

Course Learning Outcomes

On successful completion of this course, the student will be able to:

1. Describe Network Models for distributed Algorithms
2. Develop elementary synchronous distributed algorithms
3. Develop elementary asynchronous distributed algorithms

Syllabus

Unit 1 System Model/Network Models: Synchronous Network Model, Asynchronous System Model, Asynchronous Network Model

Unit 2 Synchronous Network Algorithms: Distributed problems in Synchronous Networks such as Leader Election in a Synchronous Ring. Algorithms in General Synchronous Networks (for example Leader Election in a General Network, Breadth-First Search, Maximal Independent Set etc). Problems of reaching consensus in a distributed network namely, distributed consensus with link failures coordinated Attack Problem (Deterministic Version and Randomized Version) and distributed consensus with link failures(Stopping failures, Introduction to Byzantine Failures). More Consensus Problems such as the k-Agreement etc.

Unit 3 Asynchronous Network Algorithms: Basic Asynchronous Network Algorithms such as Leader Election in a Ring, Leader Election in an Arbitrary Network etc. Logical Time Asynchronous Networks, Adding Logical Time to Asynchronous Algorithms, Applications such as Banking System etc. Basics of Network Resource Allocation (mutual Exclusion, resource allocation etc) and Basics of Asynchronous Networks with Process Failures such as k-Agreement etc.

References

1. Lynch, N. *Distributed Algorithms*, Morgan Kaufmann Publishers, Inc.,1996.
2. M. van Steen, A. S. Tanenbaum, *Distributed Systems, CreateSpace Independent* Publishing Platform, 2017.

Additional References

(i) Garg, V. *Elements of Distributed Computing*, Wiley, 2014.

Suggested Practical List

1. Implement Leader Election in a Synchronous Ring.
2. Implement Leader Election in a General Network (Synchronous Network)
3. Implement Breadth-First Search (Synchronous Network)
4. Implement Maximal Independent Set (Synchronous Network)
5. Implement Leader Election in an Asynchronous Ring.
6. Implement Asynchronous Banking System

Optional

0. Implement distributed consensus with link failure (Synchronous Network)
0. Implement distributed consensus with Process failure (Synchronous Network)

DISCIPLINE SPECIFIC ELECTIVE COURSE: Cloud Computing

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSE8e: Cloud Computing	**4**	**3**	**0**	**1**	Pass in Class XII	

Course Objective:

The objective of an undergraduate cloud computing course is to provide students with a comprehensive understanding of cloud computing technologies, services, and applications.

Course Learning Outcomes:

Learning outcomes for an undergraduate course on cloud computing may include:

1. Knowledge of the fundamental concepts and principles of cloud computing, including virtualization, scalability, reliability, and security.
2. Ability to design, develop, and deploy cloud-based applications using popular cloud platforms and services.
3. Familiarity with cloud computing architectures, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
4. Visualize the economic, legal, and ethical implications of cloud computing, including issues related to data privacy, ownership, and security.