MCA 306 Advanced OS

Module 1 (10 Hours)

Architectures of Distributed Systems - System Architecture types - issues in distributedoperating systems - communication networks – communication primitives. TheoreticalFoundations - inherent limitations of a distributed system – lamp ports logical clocks –vector clocks – casual ordering of messages – global state – cuts of a distributedcomputation – termination detection. Distributed Mutual Exclusion – introduction – theclassification of mutual exclusion and associated algorithms – a comparativeperformance analysis.

Module 2 (10 Hours)

Distributed Deadlock Detection -Introduction - deadlock handling strategies indistributed systems – issues in deadlock detection and resolution – control organizationsfor distributed deadlock detection – centralized and distributed deadlock detectionalgorithms –hierarchical deadlock detection algorithms. Agreement protocols – introduction-the system model, a classification of agreement problems, solutions to theByzantine agreement problem, applications of agreement algorithms. Distributedresource management: introduction-architecture – mechanism for building distributed filesystems – design issues – log structured file systems.

Module 3 (10 Hours)

Distributed shared memory-Architecture– algorithms for implementing DSM – memorycoherence and protocols – design issues. Distributed Scheduling – introduction – issuesin load distributing – components of a load distributing algorithm – stability – loaddistributing algorithm – performance comparison – selecting a suitable load sharingalgorithm – requirements for load distributing -task migration and associated issues.Failure Recovery and Fault tolerance: introduction– basic concepts – classification offailures – backward and forward error recovery, backward error recovery- recovery inconcurrent systems – consistent set of check points – synchronous and asynchronouscheck pointing and recovery – check pointing for distributed database systems- recoveryin replicated distributed databases.

Module 4 (10 Hours)

Protection and security -preliminaries, the access matrix model and its implementations.-safety in matrix model- advanced models of protection. Data security –cryptography:Model of cryptography, conventional cryptography- modern cryptography, privatekey cryptography, data encryption standard- public key cryptography – multiple encryption –authentication in distributed systems.

Multiprocessor operating systems - basic multiprocessor system architectures – interconnection networks for multiprocessor systems – caching – hypercube architecture.Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threads- process synchronization and scheduling.Database Operating systems :Introduction- requirements of a database operatingsystem Concurrency control : theoretical aspects – introduction, database systems – aconcurrency control model of database systems- the problem of concurrency control –serializability theory- distributed database systems, concurrency control algorithms –introduction, basic synchronization primitives, lock based algorithms-timestamp basedalgorithms, optimistic algorithms – concurrency control algorithms, data replication.

Module 5 (6 Hours)

Preferably use of MapReduce.
(as per choice of faculty)
Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Book:

1. Andrew S. Tanenbaum and Maarten van Steen. “Distributed Systems: Principles and Paradigms”, Prentice Hall, 2nd Edition, 2007. (Required)

References:

1. MukeshSinghal, NiranjanG.Shivaratri, "Advanced concepts in operating systems:Distributed, Database and multiprocessor operating systems", TMH, 2001
2. PradeepK.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.