Course Code: MSCCS-204, 10/MCA-204

Course Name: Operating System

Unit 1: Security and Protection

Introduction, Security threads, Attacks on Security, Security violation through parameters, Computer worms, Computer Virus, Security design principles, Authentication, Protection mechanism.

Unit 2: Process Synchronization

Introduction, Concurrent process – thread, The Critical-Section Problem, Synchronization Hardware, Semaphore, Classic Problems of Excises, Critical Regions, Monitors, OS Synchronization, Atomic Transactions

Unit 3: Deadlock

Introduction, System Model, Deadlock Characterization, Methods for handling deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.

Unit 4: Shell Programming

Introduction- Shell as Human interface of the system, Login shell verification: Usernames, password, Relationship between shells and kernel in Linux, Standard streams, Redirection, Pipes, Filter & Regular expression, UNIX Variable, Aliases.

Unit 5: AWK Programming

Introduction, History of awk and gawk, When to use awk, Input and Output in awk: How to run awk programs, Running awk without Input Files, Running Long Programs, Comments in awk Programs, Reading Input Files, Specifying How Fields are separated, Using Regular Expression to Separate Field, Making Each Character a Separate Field, Multiple-Line records, Expressions, Patterns and Actions, Arrays in awk.

Unit 6: Introduction to Advanced Operating Systems

Introduction, Need for Advanced Operating Systems, Types of Advanced Operating Systems: Distributed Operating Systems, Multiprocessor Operating Systems, Database Operating Systems.

Unit 7: Distributed Operating Systems

Introduction, Issues in Distributed Operating Systems: Global Knowledge, Naming, Scalability, Compatibility, Process synchronization, Resource management, Security, Structuring, Client-Server Computing Model, Communication primitives: Message Passing model, Remote procedure calls.

Unit 8: Distributed Mutual Exclusion

Introduction, System Model, Requirements of mutual exclusion algorithms, Performance metrics of mutual exclusion algorithms, 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, Agarwal-El Abbadi Quorum-Based Algorithm, The Algorithm for Distributed Mutual Exclusion, Token-based algorithms

Unit 9: Distributed Deadlock

Introduction, System model, a comparison of Resource and Communication Deadlocks, Deadlock Handling, Issue in deadlock detection, Control in deadlock detection, Centralized deadlock detection algorithms, Deadlock Resolution.

Unit 10: Distributed File Systems

Introduction, DFS Architecture, Mechanism for building DFS: Mounting, Caching and Bulk data transfer, Design issues: Naming and Name resolution, Caches on disk/main memory, Cache Consistency, Availability, Scalability, Semantics, Sun's Network File System: A case study.

Unit 11: Distributed Shared Memory

Introduction, Architecture of Distributed Shared Memory (DSM), Algorithm for implementing DSM: Central Server Algorithm, The Migration Algorithm, The Read-Replication Algorithm, Memory Coherence and Consistency Models: Strict Consistency, Casual Consistency, Weak Consistency, Release Consistency, Entry Consistency, Coherence Protocols: Write Invalidate, Write Update, Design Issue.

Unit 12: Distributed Resource Security

Introduction, Potential Security Violation Mechanism, External Vs. Internal Security, Policy: Protection domain, Design Principles for secure systems, Access Matrix Model: Access Control List Method and Capabilities, Lock Key Method, Safety in Access Matrix Model.

Unit 13: Distributed Data Security

Introduction, Cryptography: Encryption and Decryption, Strong Cryptography, How does Cryptography works?, Conventional Cryptography: Caesar's Cipher, Key Management and Conventional encryption, Models of Cryptography, Cryptographic System and ITS Classification: Private Key Cryptography, Public key Cryptography: RSA Method, Hash Functions, Authentication in Distributed System, Kerberos: A Case Study.

Unit 14: Multiprocessor Operating System

Introduction, Multiprocessors: Advantages, Classification, Uniform Memory Access (UMA), Non-Uniform Memory Access (NUMA), No Remote Memory Access (NORMA), Multiprocessor Interconnection Structure: Shared-bus Systems, Crossbar Networks, Switch-based interconnection networks, Cache Coherence Problem and solution, Multiprocessor Operating System Design Issues.

Unit 15: Database Operating System

Introduction, Transaction: Transaction State, Transaction Processing, Concurrency Control: Locking, Time-Stamping, Serializablity: Conflict Serializablity, View Serializablity, Recovery: Log-Based Recovery, Recovery using Undo logs Check Points, Shadow Paging.