Operating System

MCS- 504

Block-1

Unit I

Introduction to Operating system, User and System View, The Evolution, Operational View, Processes and Tools, Trends in Computing, Parallel Computing, Real - Time Systems, Wireless Systems.

Unit II

File Systems and Management, What Are Files?, File Types and Operations, File Access Rights, File Access and Security Concerns, File Storage Management, Inode in Unix, File Control Blocks, The Root File System, Block-based File Organization, Policies In Practice, Disk Partitions, Portable storage

Unit III

Introduction to Processes and Process management, What is a Process, Main Memory Management, Files and IO Management, Process Management, Processor Utilization, Response Time, Process States, A Queuing Model, Scheduling, Choosing a Policy, Policy Selection, Comparison of Policies, Pre-emptive Policies, How to Estimate Completion Time, Exponential Averaging Technique, Multiple Queues Schedules, Two Level Schedules, Kernel Architecture, System Calls, Layered Design, The Virtual Machine Concept, System Generation, Linux: An Introduction, The Linux Distribution, Linux Design Considerations, Components of Linux.

Unit IV

Introduction to Memory management , Main Memory Management, Memory Relocation Concept, Compiler Generated Bindings, Linking and Loading Concepts, Process and Main Memory Management, The First Fit Policy: Memory Allocation, The Best Fit Policy: Memory Allocation, Fixed and Variable Partitions, Virtual Storage Space and Main Memory Partitions,

Virtual Memory: Paging, Mapping the Pages, Paging: Implementation, Paging: Replacement, Page Replacement Policy, Thrashing, Paging: HW support, The TLB scheme, Some Additional Points, Segmentation.

Block II

Unit V

Introduction to Input Output (IO) Management, Issues in IO Management, Managing Events, IO Organization, Programmed Data Mode, Polling, Interrupt Mode, Issues in Handling Interrupts, DMA Mode of Data Transfer, A Few Additional Remarks, HW/SW Interface, Device Drivers, Handling Interrupt Using Device Drivers, Management of Buffers, Some Additional Points, Motivation For Disk Scheduling, Disk Scheduling Policies.
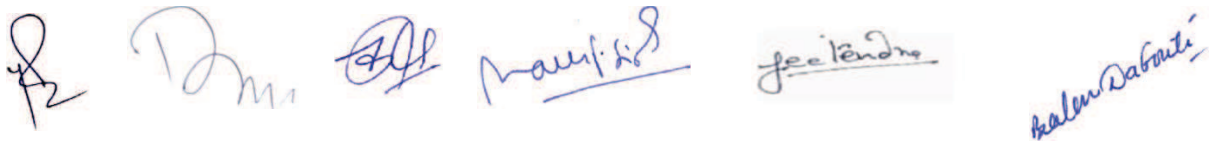
Unit VI

Introduction to Resource sharing and Management, Need for Scheduling, Mutual Exclusion Deadlocks, Deadlock Prevention Method, Deadlock Detection and Prevention Algorithms Mutual Exclusion Revisited: Critical Sections, Basic Properties of Semaphores, Usage of Semaphore, Some Additional Points.

Unit VII

Introduction to Inter-Process communication, Creating A New Process: The *fork()* System Call, Assigning Task to a Newly Spawned Process, Establishing Inter-process Communication Pipes as a Mechanism for Inter-process Communication, Shared Files, Shared Memory Communication, Message-Based IPC, Signals as IPC.

Unit VIII

Introduction to Real-time Operating Systems and Microkernels, Characteristics of real-time systems, Classification of Real-time Systems, Microkernels and RTOS, OS for Hand-held Devices, Rate Monotonic Scheduling, Earliest Deadline First Policy, Earliest Least Laxity First Policy, Priority Inversion.

Block III

Unit IX

Introduction to OS and Security, Security Breaches, Examples of Security Breaches, Attack Prevention Methods, User Authentication, Security Policy and Access Control.

Unit X

Introduction to Unix Primer, Motivation, Unix Environment, Unix File System, Some Useful Unix Commands, Unix Portability. Search and Sort Tools, *grep, egrep*and *fgrep,* Using *find,* SortTool, AWK Tool in Unix The Data to Process, AWK Syntax, Programming Examples, Some One-liners, AWK Grammar, More Examples, More on AWK Grammar.
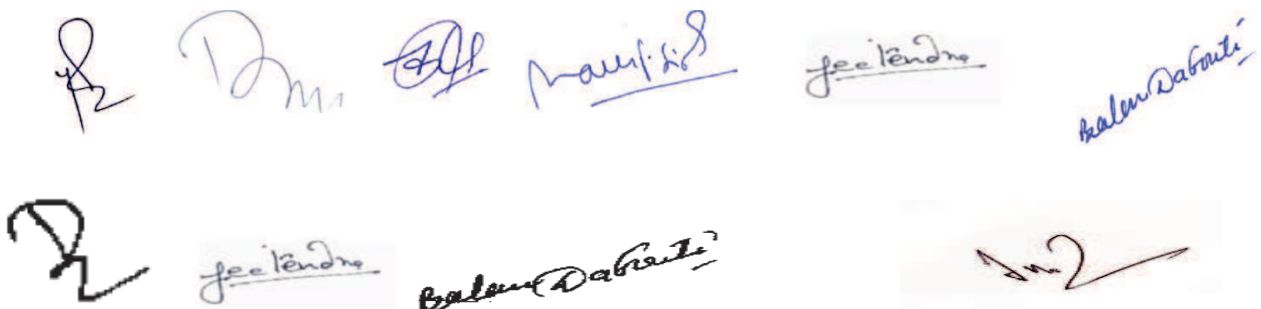
Unit XI

Shell Scripts in UNIX, Facilities Offered by Unix Shells, The Shell Families, Subshells, The Shell Programming Environment, Some Example Scripts, Example Shell Scripts, Unix Kernel Architecture, User Mode and Kernel Mode, System Calls, An Example of a System Call, Process States in Unix, Kernel Operations, The Scheduler, Linux Kernel
Linux Sources and URLs

Unit XII

Make Tool In UNIX, When to Use Make, How Make Works?,Macros, Abstractions, and Shortcuts, Inference Rules in Make, Some Additional Options, Mastermakefiles, Some Other Tools in UNIX, Tar and Other Utilities, Compression, Image File Formats for Internet Applications, Performance Analysis and Profiling, Source Code Control System in UNIX, How Does Versioning Help, The SCCS, How This Is Achieved?, SCCS Command Structure, An Example Session, CVS : Concurrent Versioning System.

Unit XIII

X Windows in UNIX, Graphical User Interface (GUI), X-Window System, Some Standard X-

clients, Hosts, Selecting a host for Display, X-Utilities, Startup, Motif and X. System Administration in UNIX, Unix Administration Tasks, Administration Tasks List Starting and Shutting Down, Managing User Accounts, The *.rc*Files, Sourcing Files Device Management and Services, The Terminal Settings, Printer Services, Disk space allocation and management.

Unit XIV

More on LINUX (Linux Kernel Architecture), Linux Kernel:Hardware, The Linux Kernel Purpose of the Kernel, TheLinux Kernel Structure Overview, Process Management Scheduler, The Memory Manager, The Virtual File System (VFS), The Network Interface, Inter Process Communication, System Calls, Systems Call Interface in Linux, The Memory Management Issues, Linux File Systems, *Device specific files,* The Virtual File system, The VFS Structure andfile management in VFS, The Second Extended File System (EXT2FS), Advanced Ext2fs features, Physical Structure, The EXT3 file system, THE PROC FILE SYSTEM, DEVICE DRIVERS ON LINUX, Device classes, Block devices, Network devices, Major/minor numbers, Character Drivers, Important Data Structure, The file operations structure(fops):<linux/fs.h>, Advance Char Driver Operations, Blocking and non-blocking operations, Asynchronous Notification, Interrupt Handling in LINUX 2.4, Top Half And Bottom Half Processing, Linux Installation, The Installation, The Installation Program, Finishing the installation.

Suggested Reading:

1. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, Wiley-Indian Edition (2010).
2. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008).
3. Principles of Operating Systems by Naresh chauhan, Oxford Press (2014).
4. Operating Systems by D.M. Dhamdhere, Tata McGraw Hill 2nd edition.
5. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000.
6. UNIX Concepts and Applications(4th Edition)– by Sumitabha Das, Tata McGraw Hill.