Course: Major
Advanced Operating System

Semester: II	Credits:4	Subject Code: SMAJCAOS223551	Lectures: 60

Course Outcomes:

At the end of this course, the learner will be able:

- CO1-To learn Advanced Operating Systems Concepts using Unix/Linux and buffer allocation
- CO2-To Apply Shared Data access and Files concepts
- CO3-To describe the system call interface to the Unix/Linux system.
- CO4-To gained insight into hardware-software interactions for compute and I/O and have practical skills in system tracing and performance analysis
- CO5-To Build the program to demonstrate concept of process and memory management
- CO6-To understanding the unique design requirements of different applications onoperating systems such as memory management and signal

Unit 1:Concept of UNIX/Linux Kernel and buffer	15

- Introduction to UNIX/Linux Kernel -Introduction to Kernel /Shell Programming, Unix Commands, System Structure, User Perspective, Assumptions about Hardware, Architecture of UNIX Operating System
- Concepts of Linux Programming- Files and the File system, Processes, Users and Groups, Permissions, Signals, Interprocess Communication
- Buffer headers, structure of the buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks, inodes, structure of regular file, open, read, write, lseek, close, pipes, dup

Unit 2:File and Directory I/O	15

- File I/0-open, create, file sharing, atomic operations, dup2, sync, fsync, and fdatasync, fcntl, /dev/fd, stat, fstat, lstat, file types, Set-User-ID and Set-Group-ID, file access permissions, ownership of new files and directories, access function, umask function, chmod and fchmod, sticky bit, chown, fchown, and lchown, file size, file truncation, file systems, link, unlink, remove, and rename functions, symbolic links, symlink and readlink functions, file times, utime
- Directory I/0-mkdir and rmdir, reading directories, chdir, fchdir, and getcwd, device special files
- Advanced system call-Scatter/Gather I/O, Mapping Files into Memory, Advice for Normal File I/O, I/O Schedulers and I/O Performance, Directories, Copying and Moving files, Device Nodes, Out-of-Band Communication

Unit 3: Process Environment, Process Control and Process Relationships	15

- Process Environment, Process Control and Process Relationships-System boot and

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INIT process, Process states and transitions, layout of system memory, the context of a process, saving the context of a process, sleep, process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process, changing the size of the process, The Shell, Process Scheduling ,Process termination, environment list, memory layout of a C program, shared libraries, environment variables, setjmp and longjmp, getrlimit and setrlimit, process identifiers, fork, vfork, exit, wait and waitpid, waitid, wait3 and wait4, race conditions, exec, changing user IDs and group IDs,system function, user identification, process times

- The Process ID, Running a New Process, Terminating a Process, Waiting for Terminated Child Processes, Users and Groups, Daemons, Process Scheduling, Yielding the Processor, Process Priorities, Processor Affinity

Unit 4: Memory Management and Signal handling	**15**

- Memory Management-The Process Address Space, Allocating Dynamic Memory, Managing Data Segment, Anonymous Memory Mappings, Advanced Memory Allocation, Debugging Memory Allocations, Stack-Based Allocations, Choosing a Memory Allocation Mechanism, Manipulating Memory, Locking Memory, Opportunistic Allocation, Swapping, Demand Paging
- Signal Handling- Signal concepts, signal function, unreliable signals, interrupted system calls, reentrant functions, SIGCLD semantics, reliable-signal technology, kill and raise, alarm and pause, signal sets, sigprocmask, sigpending, sigsetjmp and siglongjmp, sigsuspend, abort, system function revisited, sleep
- Signal Concepts, Basic Signal Management, Sending a Signal, Reentrancy, Signal Sets, Blocking Signals, Advanced Signal Management, Sending a Signal with a Payload

Reference Books:

- A Robbins, *Linux Programming by Example: The Fundamentals"*, 2nd Edition, 2008, ISBN 9788131704196, Pearson Education.
- Maurice J. Bach, *The Design of the UNIX Operating System*, PHI.
- Robert Love, *Linux System Programming*, O'Reilly.
- Richard Stevens, *Advanced Programming in the UNIX Environment*, Addison-Wesley.

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