

1. Course Number and Name: 221 CPE – Operating Systems and System Software

2. Credits and Contact Hours: 3 Credit

- a. Lecture – 2 day per week at 50 minutes for 16 weeks
- b. Laboratory – 1 day per week at 100 minutes for 16 weeks

3. Course Coordinator or Instructor:

Dr. Paul

4. Text Book:

- Applied Operating System Concepts, 1st Edition, John Willey & Sons, by Abraham Silberschatz, Peter Galvin, Greg Gane.
- Systems Programming and Operating Systems, 2nd Edition, McGraw-Hill, 1999, by D. M. Dhamdhere.

5. Specific Course Information:

- a. **Catalog Description:** This course is focus on the fundamental design and implementation issues in the operating systems and systems software.
- b. **Prerequisites:** 210 CPE Object Oriented Programming
- c. **Status:** Required

6. Specific Goals for the Course:

a. Course Outcomes:

1. Develop the abilities to identify, formulate and solve computer engineering problems by way of learning the capabilities to analyze and implement scheduling algorithms and File/ Directory/ Memory Management techniques
2. Develop an ability to design an operating system to meet desired needs within realistic constraints
3. Develop an ability to write computer programs and interpret the results
4. Develop programming skills to develop an application using High level Languages.
5. Demonstrate the ability to work independently and within a team on projects related to OS internals
6. Analyze and realize the professional and ethical responsibility in quality software development using concepts like open source programming.

b. Student outcomes in Criterion 3 addressed by course:

Course LOs #	Map course LOs with the program LOs. (Place course LO #s in the left column and Student LO #s across the top.)											
	Student Learning Outcomes Use LOs Codes											
	a1	a2	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2
1			√									
2				√								
3					√							
4							√					
5								√				
6										√		

7. List of Topics: 221 CPE – Operating Systems and System Software

List of Topics for Theory:

- **Introduction to Operating System:** Computer System components, Mainframe Systems, Batch Systems, Time-Sharing Systems, Desktop Systems, Personal-Computer Systems, Parallel Systems, Real-Time Systems Distributed Systems, Clustered Systems, Unix linux OS basics, linux utility programs & commands.
- **Operating System Structures:** Computer-System Structures, Computer-System Operation, Common Functions of Interrupts, Interrupt Handling, Hardware protection, Operating System Components, Systems Calls, System Programs, Operating System Structures, layers of Linux OS, Shell programming.
- **Process Management:** Process Concepts, Process Scheduling, Operations on Processes, Cooperating Processes, Inter-process Communication, Threads, Race condition, Process Synchronization, Critical-Section Problem, Semaphores, Monitors, deadlocks.
- **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread Scheduling.
- **File Management:** File basic concepts, file attributes, file types, file operations, file access methods Directory structure, operations on directories.
- **Memory Management:** Storage Structure, Storage Hierarchy, Swapping, Memory management techniques - Single contiguous allocation, Partitioned allocation, Paged memory management, Segmented memory management, Virtual memory.
- **Linux system:** Components of Linux system, Kernel system, Process management, process & Threads, Process scheduling, Memory management.
- **System Software:** Types of system software, Common system software programs, Assemblers, Translators, Compilers, Interpreters, Macro processor, Editors, Debuggers, Loaders, Linkers.

List of Topics for Laboratory:

- Introduction to Operating System and Types of Operating System. Brief Introduction on Linux. Structure of UNIX with system directory's. Usage of basic system commands like date, time, who, cal, whoami, etc.,
- Linux commands to create, open, remove and rename directories and files and other commands. Usage of different editors like vi, gedit Advanced options in vi and gedit.
- Shell Programming – I, Redirection I/O, Shell Aliases and Functions. Introduction to Shell and types of shells, Features and Use of Shell Scripts. Shell Scripting in bash.
- Shell Programming – II, Basic characters, Scalar Variables, Storing values in Scalar variables, Expressions and Operators. Shell arithmetic and character functions using bash
- Process management:- Starting a Process, Listing Running Process, using top, Kill a process.
- Create process using fork & exec in Linux with C
- Inter Process Communication using C
- CPU Scheduling Algorithms using C: a) First Come-First Serve (FCFS), b) Shortest Job First (SJF)
- CPU Scheduling Algorithms using C – Priority & Round Robin
- Directory Management - Directory operations using C
a) Make new directories, b) Removing directories
- File Management – File operations using C
a) Create file, b) list all files
- File Management – File operations using C (a) Copy file, (b) Remove file
- Memory Management using C