**University of Engineering and Technology Lahore  
Course Outline Report  
Subject: CS-362 Operating System**

**Course Description**

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| This course is intended to study operating system design, and takes an in-depth look at the design of robust multitasking operating systems. We will study theoretical and practical issues with an objective to attempt designing robust operating systems. Important topics include naming, operation, structure, process, process scheduling, Inter-process communication, process synchronization, deadlock, memory management, system protection and security, and distributed systems. |

**Course Detail**

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| Contact Hrs. | 3 |
| Pre-requisite | * CS-271 Computer organization and assembly Language * CS-212 Data structures and algorithms |

**Measurable Student Learning Outcomes**

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| **CLOs** | **Description** | **PLOs** | **Domain** | **Domain Level** |
| CLO1 | Describe the characteristics of different structures of the Operating Systems and identify the core functions of the Operating Systems. | 01 | Cognitive | 2. Understand |
| CLO2 | Access the algorithms of the core functions of the Operating Systems and explain the major performance issues regarding the core functions. | 01 | Cognitive | 5. Evaluate |
| CLO3 | Compare the important UNIX and Linux data structures and its various services through programming exercises | 05 | Cognitive | 4. Analyze |
| CLO4 | Discuss some of the security features of operating System | 06 | Cognitive | 2. Understand |

**Text Books**

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| 1. **Book1:** Silberschatz A., Peterson, J.L., & Galvin P.C., "Operating Systems Concepts", 10th Edition. 2. **Book2:** Tanenbaum A.S., "Modern Operating Systems", Published by Pearson, 3rd Edition. 3. **Book3:** Stalling, W., Operating Systems: Internals and Design Principles, Published by Pearson, 8th Edition. |

**Tentative Weekly Lecture Plan**

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| **Week** | **Topics** | **CLO(s)** |
| 1 | Overview, Computer system organization, Introduction to basic concepts of Operating Systems, Kernel and operating systems basic Architecture, basic operations of operating system, single processor system, Multiprocessor system, time sharing system, multi-processing/multi-programming | 1 |
| 2 | Operating system structures, user and operating system interface, introduction to the system call, types of system calls, operating system design and implementation. Simple structures, layered approach, Microkernels. M.S DOS layer structure, traditional UNIX System Structure. | 1 |
| 3 | Process: definitions and basic concepts, tree of process on typical Linux system, Operations on processes, UNIX process creation system call, process states. | 1,2 |
| 4 | Introduction to long/short term process scheduling, Inter-process communication (IPC), shared memory, message passing, Examples of IPC systems, POSIX shared memory system, Process communication in client-server, WINDOWS ALPC facility | 1,2 |
| 5 | Threads overview, multicore programming, programming challenges, multi-threading models, thread pools, thread libraries, threads issues, LINUX threads | 2,3 |
| 6 | Process synchronization: background, critical section problem, solutions to the critical section problems | 2,3 |
| 7 | Process synchronization: dead locks and starvation, classic problems of process synchronization, examples of synchronization | 2,3 |
| 8 | Deadlocks: deadlock characterization, methods for handling dead lock, deadlock prevention, deadlock avoidance, deadlock detection and recovery from deadlock. | 2,3 |
| 9 | Mid Term Exam |  |
| 10 | Process scheduling (I): basic concepts, scheduling criteria, scheduling algorithms | 2,3 |
| 11 | Process Scheduling (II): Scheduling algorithms, Multiple processor scheduling, Scheduling examples (Assignment) | 2,3 |
| 12 | Memory Management: Background, swapping, contiguous memory allocation, paging, protections, example intel 32 and 64 architecture. (Assignment) | 1,2 |
| 13 | Virtual Memory: demand paging, copy on write, page replacement, Thrashing, allocating kernel memory, operating system examples | 1,2,3 |
| 14 | File system interface: file concepts, access methods, directory and disc structure, file sharing, protection | 1,2,3 |
| 15 | Mass Storage structure: Disc scheduling, Disk attachment | 2,3 |
| 16 | Security: security problems, program threats, system and network threats, cryptography as tool to security, user authentication, computer security classifications. Operating system examples | 4 |