**UE18CS302 : OPERATING SYSTEM (4:0:0:0:4)**

# of Hours: 56

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|  |  | Topic to be covered | Percentage of portions covered | |
| Class # | Unit description |
|  |  | % of Syllabus | Cumulative % |
| 1 |  | Introduction: What Operating Systems Do, Computer-System Organization | 21.40% | 21.40% |
| 2 |  | Computer-System Architecture, Operating-System Structure & Operations |
| 3 |  | Kernel Data Structures, Computing Environments |
| 4 |  | Operating-System Services, Operating-System Design and Implementation |
| 5 | Unit 1 | Process concept: Process in memory, Process State, PCB, Context Switch, Process Creation and Termination |
| 6 | T1 (Chap 1-3,5) | CPU Scheduling & Scheduling Algorithms, Preemptive and Non-Preemptive, Scheduling criteria, |
| 7 |  | Scheduling Algorithms: FIFO, SJF |
| 8 |  | Round Robin, Priority Scheduling |
| 9 |  | Multi-Level Queue, Multi-Level Feedback Queue |
| 10 |  | Case Study: Linux/ Windows Scheduling Policies. |
| 11 |  | Inter Process Communication – Shared Memory, Messages |
| 12 |  | Named and unnamed pipes |
| 13 |  | Introduction to Threads, types of threads, Multicore Programming, Multithreading Models , | 21.40% | 42.80% |
| 14 |  | Thread creation, Thread Scheduling |
| 15 |  | Pthreads and Windows Threads |
| 16 | Unit 2  T1(Chap 4-7) | Mutual Exclusion and Synchronization, software approaches, |
| 17 |  | principles of concurrency, hardware support |
| 18 |  | Mutex Locks, Semaphores |
| 19 |  | Classic problems of Synchronization: |
|  |  | Bounded-Buffer Problem, Readers-Writers problem |
| 20 |  | Dining-Philosophers Problem |
| 21 |  | Synchronization Examples: Synchronisation mechanisms provided by |
|  |  | Linux/Windows/Pthreads. |
| 22 |  | Deadlocks: principles of deadlock, Deadlock Characterization |
| 23 |  | Deadlock Prevention, Deadlock example |
| 24 |  | Deadlock Detection, Algorithm | 21.40% |  |
| 25 |  | Main Memory: Hardware and control structures, OS support, Address translation |  |
| 26 |  | Dynamic linking, Swapping |  |
| 27 |  | Memory Allocation (Partitioning, relocation), Fragmentation |  |
| 28 |  | Segmentation |  |
| 29 |  | Paging: OS Support, TLBs, Address Translation |  |
| 30 | Unit 3 | Structure of the Page Table | 64.20% |
| 31 | T1 (Chap 8-9) | Design Alternatives – Inverted Page Tables, Bigger Pages |  |
| 32 |  | Virtual Memory: Demand Paging, Copy-OnWrite |  |
| 33 |  | Page replacement policy – LRU |  |
| 34 |  | FIFO & Optimal |  |
| 35 |  | Thrashing |  |
| 36 |  | Case Study: Linux/ Windows Memory Management |  |
| 37 |  | Mass-Storage Structure: Mass-Storage overview |  |  |
| 38 |  | Disk Scheduling – FCFS, SSTF, SCAN, C-SCAN, LOOK |  |  |
| 39 |  | Swap-Space Management, RAID Structure |  |  |
| 40 |  | File Concept, File Structure, Access Methods |  |  |
| 41 | Unit 4 | Directory and Disk Structure | 17.80% | 82.10% |
| 42 | T1 (Chap 10-14,16) | File-System Mounting, File Sharing, Protecting |  |  |
| 43 |  | Implementing File-Systems: File control Block (inode), partitions & mounting |  |  |
| 44 |  | Disk Space Allocation methods: Contiguous, Linked, Indexed |  |  |
| 45 |  | Case Study: Unix/Linux File systems |  |  |
| 46 |  | NFS |  |  |
| 47 |  | I/O Hardware, polling and interrupts |  |  |
| 48 |  | DMA |  |  |
| 49 |  | Transforming I/O Requests to Hardware Operations, Device interaction, device driver, buffering. |  |  |
| 50 | Unit 5 | Goals, Principles and Domain of Protection |  |  |
| 51 | T1 (Chap 14-15,21) | Access Matrix | 17.80% | 100% |
| 52 |  | Access control, Access rights |  |  |
| 53 |  | The Security Problem |  |  |
| 54 |  | Program Threats |  |  |
| 55 |  | System Threats and Network Threats |  |  |
| 56 |  | Case Study : Linux & Windows |  |  |
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| Pre-requisite Courses: Data Structures, Microprocessor and Computer Architecture. | | | | |  |  |
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| Text Book: |  |  |  |  |  |  |
| Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne 9th Edition, John\_Wiley\_&\_Sons, 2013. | | | | |  |  |
|  |  |  |  |  |  |  |
| References: |  |  |  |  |  |  |
| 1.      Operating Systems, Internals and Design Principles, William Stallings, 9th Edition, Pearson, 2018 | | | | |  |  |
| 2.      Operating Systems: Three Easy Pieces, Remzi Arpaci-Dusseau and Andrea Arpaci Dusseau, http://pages.cs.wisc.edu/~remzi/OSTEP/ | | | | | |  |
| 3.      Advanced Programming in the Unix Environment”, Richard Stevens and Stephen A Rago, Pearson, 3rd edition,2017 | | | | |  |  |
| 4.      Operating Systems, Harvey Deitel, Paul Deitel, David Choffnes, 3rd Edition, Prentice Hall | | | | |  |  |
| 5.      Modern Operating Systems, Andrew S Tannenbaum, 3rd edition, Pearson | | | | |  |  |