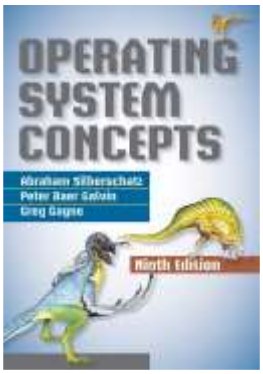
Birla Institute of Technology & Science, Pilani
Hyderabad Campus
Computer Science and Information Systems Department
First Semester 2018-2019 Course Handout (Part II)

Date: **01/08/ 2018**

In addition to Part-I (General handout for all courses appended to the timetable) this portion gives further specific details regarding the course:



COURSE NO.: CS F372

OPERATING SYSTEMS

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Scope:

An operating system (OS) is a set of software that manage computer hardware resources and provide common services for all computer programs that are executed on it. In other words, it acts as a manager of resources. The OS provides an established, convenient, and efficient interface between user programs and the bare hardware of the computer on which it runs. It provides relatively uniform interfaces to access the extremely wide variety of devices that a computer interacts with, from input/output devices such as printers and digital cameras, to multiple processors that are available on a single board. The OS is responsible for sharing resources (e.g., disks, and processors), providing common services needed by many different programs (e.g., access to the printer), and protecting individual programs from interfering with one another. There is a tremendous range and variety of computer systems for which operating systems are being designed: from embedded devices e.g., the on-board computers for the space shuttle or a luxury sedan and cellphones to PCs, workstations, and mainframes, to supercomputers. The intent of this course is to provide a thorough discussion of the fundamentals of operating system concepts, and to relate these to contemporary design issues and current directions in the development of operating systems.

Objectives:

- To learn about three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems.
- We will also study existing operating systems such as Linux/Windows and learn the way the studied concepts in the course are implemented in these OSs.

TEXT BOOK

T1 Silberschatz, Galvin, and Gagne, "Operating System Concepts", 9e, John Wiley & Sons, 2012.

REFERENCE BOOKS

R1 W. Stallings, "Operating Systems: Internals and Design Principles", 6e, Pearson, 2009.
R2 Tanenbaum, Woodhull, "Operating Systems Design & Implementation",3e, Pears, 2006.
R3 Dhamdhere, "Operating Systems: A Concept based Approach", 2e, McGrHi, 2009.
R4 Robert Love, "Linux Kernel Development", 3e, Pearson, 2010.

PLAN OF STUDY:

S. No.	Learning Objectives	TOPIC	CHAPTER REF (Text)	#Lect.s
1.	Various components of a computer and the role an OS play to control those.	Introduction: What OS's do? Computer System Organization & Architecture, OS Operations, Computing environments.	Chapter 1	4
2.	How a system boots and what functions and services an OS provides?	OS Structures: OS Services, Interfaces, System calls, OS structure, OS Debugging, System boot.	Chapter 2	3
3.	At runtime how does a process work and how they communicate with each other.	Processes: Process Control Block (PCB), Process states, Operations on processes, Inter Process Communication (IPC), Scheduling queues, Types of schedulers, Context switch.	Chapter 3	4

4.	Light weight processes and their impact on managing system resources.	Threads: Motivation, Benefits, Multicore programming, Multithreading models, Thread library, Threading issues.	Chapter 4	3
5.	Single and multiple CPU process scheduling.	CPU Scheduling: Scheduling Criteria, Scheduling Algorithms, Thread scheduling, Algorithm evaluation.	Chapter 6	4
6.	How a concurrent access requests are to serialized?	Process Synchronization: Critical section problem, Peterson's solution, Hardware solutions, Semaphores, Classical synchronization problems, Monitors.	Chapter 5	4
7.	How multiple processes could end up in waiting indefinitely and how to solve this?	Deadlocks: Resource Allocation Graphs, Cycle Vs Knot, Solutions to deadlock: Ignorance, Prevention, Avoidance, Detection, and Recovery from deadlocks.	Chapter 7	3
8.	How main memory is divided into different parts and arranged so that degree of multiprogramming can be increased.	Main Memory Management: Address binding, Logical vs physical address space, Dynamic loading, Swapping, Contiguous memory allocation, Paging: Hardware support, Structure of Page table, Segmentation.	Chapter 8	4
9.	How to combine the size of RAM and Hard disk to get a Virtual memory so that larger programs can be run.	Virtual Memory: Demand paging, Page replacement algorithms, Allocation of frames, Thrashing, Memory mapped files, Allocating Kernel memory.	Chapter 9	3
10.	What abstraction OS provides to access contents from a hard disk?	File System Interface: File system, Access methods, Mounting, sharing, and disk structures.	Chapter 11	2
11.	How is the FS implementation help improve the efficiency of storage space?	File System Implementation: Structure and Implementation, Allocation methods and Free space management.	Chapter 12	3
12.	Secondary storage structures with IO scheduling and redundancy?	Mass Storage: Disk structure, disk scheduling, disk management, and RAID.	Chapter 10	2
13.	How OS manages various I/O devices?	I/O Systems: I/O hardware, I/O Interface, Kernel I/O subsystem.	Chapter 13	2
14.	How OS provides security or access control schemes?	Goals of protection, Access Matrix: Access Control List, and Capability-based implementations.	Chapter 24	1

EVALUATION SCHEME:

Sl No.	Component & Nature	Duration	Weightage	Date and Time
1.	Assignments (Take home, Open Book)	-	30%	-
2.	Evaluative tutorials (2 Quizzes) Closed book	20 mins	10%	Two quizzes (5.00pm on 31st Aug, 28th Sept)
3.	Mid-Sem Test (Closed Book)	1.5 hours	25%	
4.	Comprehensive Exam (Open-15%+ Close-20%)	3 hours	35%	

Tutorial classes will be of problem solving nature and coding/implementation aspects on the theory covered in the classes. Any outside help concerning the use of the computer facilities is acceptable. Some of the tutorials may need students to bring their computing devices to the tutorial class (laptops). Quizzes will be conducted in the tutorials that will cover theory as well as tutorial class materials.

Note: Some notices related to the course will be displayed on the Computer Science Department's Notice Board and some on the CMS portal. Make ups shall be granted to genuine cases with a request for makeup reaching the I/C before the test.

Chamber Consultation Hour: Would be announced in the class.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge, **CS C372**