Ahmedabad University

School of Engineering and Applied Science

BTech (ICT), Semester – V

Course Code: CSC340M

Course Title: Operating Systems

COURSE OUTLINE

Faculty Name	Sanjay Chaudhary			Sections	1
Contact	sanjay.chaudhary@ahduni.edu.in	Office Hours	Monday – Tuesday: 4 – 5 p.m.		
School	School of Engineering and Applied Science				
Semester	Monsoon			Credits	3
Lecture time & Weekdays	Tuesday and Thursday: 11:00 – 12:30	Location	106, SEAS		
Pre-requisites	Computer Organization, Object-Oriented Programming, and Data Structures and Algorithm				
Course Description	It is a foundation course for 'Information and Communication Technology (ICT)' stream to introduce basic concepts and internals of modern operating systems.				
Course Abstract *	The course will introduce the fundamental concepts of operating system. The course relates these fundamentals with the design issues related to the development of modern operating systems. Understanding of concepts will be visualized and realized using system programming. Topics include Process Management, Process Scheduling, Concurrency, Memory Management, Virtual Memory, I/O Management and Disk Scheduling, Security, Distributed Systems, Virtualization and Operating Systems for Mobile Devices.				
Course Objectives	• To teach elements of system programming • To introduce how computer systems manage, interpret, and execute applications • To teach communications with peripheral devices and interrupt handling • To explain basic functional units and building blocks of operating systems				
Learning Outcomes	At the end of the course, student will • Be able to learn the relationships between computer architecture and system software. • Be able to learn the concepts of computing as service and APIs. • Be able to see the relationship between the stand-alone system software (traditional OS) and network software (distributed OS or network protocol suite) • Be able to learn practical hands-on experience in designing and implementing stand-alone and networked software using low-level system constructs. • Be able to learn the concepts and methods in designing various types of system software, how computer systems really work. • Be prepared for "system level" courses.				
Pedagogy *	Lectures				

Expectations from Students *	
Assessment / Evaluation	In-semester exams 50%, End-semester exams 40% Attendance and Class room participation 10%
Attendance Policy	80%
Project / Assignment Details *	
Course Material	Text Book: • `Operating Systems: Internals and Design Principles', eight edition, by William Stallings, Prentice-Hall of India Private Limited, ISBN-10: 0133805913, ISBN-13: 978-0133805918, 2012 Reference Books: • "Computer Systems: A Programmer's Perspective", Bryant and O'Hallaron, First edition, Pearson Education, ISBN-10: 0136108040, ISBN-13: 978-0136108047, 2010 • `Operating System Concepts', by Silberschatz, Galvin and Gagne, 8th edition, John Wiley and Sons, ISBN-13 9788126520510, 2009 • `Operating Systems: a concept-based approach', by D. M. Dhamdhere, Tata McGraw Hill Publishing Company, ISBN-13 9781259005589 • `Operating Systems: Design and Implementation', by Andrew Tanenbaum and Albert Woodhull, Prentice-Hall of India Private Limited • `Distributed Operating Systems', by Andrew Tanenbaum, Pearson Education, Asia
Additional Information *	It is offered as a core course for BTech (ICT) programme, semester – V.

* These are optional fields.

Session Plan

Topic Title	Session No.	Topic & Subtopic Details	Readings, Cases, etc.	Activities	Important Dates
Unix Operating System	1.	Architecture, Unix system calls, Unix commands			
Shell Programming	2.	Advanced Unix commands, shell programming			
Introduction to Operating Systems	3.	Introduction to Operating Systems			
Shell Programming	4.	Unix internals, Advanced features of Shell Programming			

Process Management	5.	Process, Process Control Block, Process Attributes, Process States			
Process Management	6.	Process Creation, User and kernel mode, Context Switches			
Process Management	7.	System Calls for Process Management, Process Creation: fork, Process Termination			
Inter-process Communication	8.	Mutual Exclusion, Inter-process Synchronization, Signals			
Inter-process Communication	9.	Signal Generation and Handling			
Inter-process Communication	10.	Semaphore			
Inter-process Communication	11.	Pipes, Message Passing, Shared Memory			
File Systems	12.	Files and Directories, File Attributes, File Sharing, Ownership and Permission, Symbolic Link, System Calls for File Handling, Standard Input, Standard Output, and Standard Error			
Process Scheduling	13.	Process scheduling algorithms for uniprocessor			
Process Scheduling	14.	Process scheduling algorithms for multiprocessor systems			
Concurrency	15.	Concurrency, Issues related to Concurrency			
Concurrent Programming	16.	Threads and Lightweight			

		Processes, Threads: user and kernel level			
Memory Management	17.	Contiguous allocation, Non-contiguous allocation, Segmented allocation, Page allocation, Need for dynamic memory allocation, Fragmentation, Coalescing, Garbage Collection, Memory-Related Bugs			
Memory Management	18.	Logical vs. Physical Addresses and address translation, Performance and caching, Large Logical Address Spaces			
Virtual Memory	19.	Virtual Memory Techniques, Page Faults, Page Replacement Algorithms, Thrashing, Virtual memory, Page replacement, Strategies, Working Set			
Concurrency	20.	Deadlocks and Starvation, Deadlock Handling Approaches: Deadlock prevention, Deadlock avoidance, Deadlock detection			
Network Programming	21.	Sockets, Remote Procedure Call, Remote Method Invocation, Object Serialization and Object Persistence			
Parallel Programming	22.	Thread programming, parallel programming			

		models: domain decomposition, task decomposition and pipelining			
Parallel Programming	23.	Languages and libraries for parallel programming, multi-core programming			
I/O Management and Disk Scheduling	24.	I/O Devices, I/O buffering, Disk Scheduling			
I/O Management and Disk Scheduling	25.	Redundant Array of Independent Disks (RAID), Disk Cache			
Security	26.	Security threats/attacks, Protection, Intruders, Malicious Software, Secure Communication Protocols, Trusted Systems			
Distributed Systems	27.	Attributes of Distributed Systems, Client/Server, Distributed shared memory, Distributed file systems: NFS, Introduction to Clusters, Peer-to-peer, Grid Computing, Cloud Computing			
Virtualization	28.	Concepts, Types of Virtualization			
Virtualization	29.	Implementation and Challenges			
Operating Systems for Mobile Devices	30.	Operating Systems for Mobile Devices: Android			