

<p style="text-align: center;"><b>SavitribaiPhule Pune University</b>  <b>T.Y.B.Sc. (Computer Science) - Sem – V</b>  <b>Course Type: DSEC – I                      Course Code : CS - 351</b>  <b>Course Title : Operating Systems – I</b></p>		
Teaching Scheme: 03 Lect / week	No. of Credits: 2	Examination Scheme: IE : 15 marks UE: 35 marks
<b>Prerequisites</b> Data structures like stack, queue, linked list, tree, graph, hashing, file structures, any structured programming language		
<b>Course Objectives:</b> 1. To understand the concept of operation system and its principle 2. To study the various functions and services provided by operating system 3. To understand the notion of process and threads		
<b>Course Outcomes: After completion of this course students will be able to understand the concept of</b> 1. Processes and Thread Scheduling by operating system 2. Synchronization in process and threads by operating system 3. Memory management by operating system using with the help of various schemes		
<b>Course Contents</b>		
<b>Chapter 1</b>	<b>Introduction to Operating Systems</b>	<b>6 lectures</b>
<ul style="list-style-type: none"> <li>Operating Systems Overview- system Overview and Functions of operating systems</li> <li>What does an OS do?</li> <li>Operating system Operations</li> <li>Operating system structure</li> <li>Protection and security</li> <li>Computing Environments- Traditional, mobile , distributed, Client/server, peer to peer computing</li> <li>Open source operating System</li> <li>Booting</li> <li>Operating System services,</li> <li>System calls Types of System calls and their working.</li> </ul>		
<b>Chapter 2</b>	<b>Processes and Threads</b>	<b>6 lectures</b>
<ul style="list-style-type: none"> <li>Process Concept – The processes, Process states, Process control block.</li> <li>Process Scheduling – Scheduling queues, Schedulers, context switch</li> <li>Operations on Process – Process creation with program using fork(), Process termination</li> <li>Thread Scheduling- Threads, benefits, Multithreading Models, Thread Libraries</li> </ul>		
<b>Chapter 3</b>	<b>Process Scheduling</b>	<b>7 lectures</b>
<ul style="list-style-type: none"> <li>Basic Concept – CPU-I/O burst cycle, Scheduling Criteria ,CPU scheduler, Preemptive scheduling, Dispatcher</li> <li>Scheduling Algorithms – FCFS, SJF, Priority scheduling, Round-robin scheduling, Multiple queue scheduling, Multilevel feedback queue scheduling</li> </ul>		
<b>Chapter 4</b>	<b>Synchronization</b>	<b>5 lectures</b>
<ul style="list-style-type: none"> <li>Background</li> <li>Critical Section Problem</li> <li>Semaphores: Usage, Implementation</li> </ul>		

<ul style="list-style-type: none"> <li>• Classic Problems of Synchronization – The bounded buffer problem, The reader writer problem, The dining philosopher problem</li> </ul>		
<b>Chapter 5</b>	<b>Memory Management</b>	<b>12 lectures</b>
<ul style="list-style-type: none"> <li>• Background – Basic hardware, Address binding, Logical versus physical address space, Dynamic loading, Dynamic linking and shared libraries</li> <li>• Swapping</li> <li>• Contiguous Memory Allocation – Memory mapping and protection, Memory allocation, Fragmentation</li> <li>• Paging – Basic Method, Hardware support, Protection, Shared Pages</li> <li>• Segmentation – Basic concept, Hardware</li> <li>• Virtual Memory Management – Background, Demand paging, Performance of demand paging, Page replacement – FIFO, Optimal, LRU, MFU</li> </ul>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Operating System Concepts, Avi Silberschatz, Peter Galvin, Greg Gagne, Student Edition, Wiley Asia</li> <li>2. Operating Systems: Internals and Design Principles, William Stallings, Prentice Hall of India.</li> <li>3. Advanced Concepts in Operating Systems, M Singhal and NG Shivaratri, Tata McGraw Hill Inc, 2001</li> <li>4. The ‘C’ Odyssey, UNIX-the open boundless C, Meeta Gandhi,Tilak Shetty,Rajiv Shah, BPB publication</li> </ol>		

<p align="center"> <b>Savitribai Phule Pune University</b>  <b>T.Y.B.Sc. (Computer Science) - Sem – VI</b>  <b>Course Type: DSEC - IV                      Course Code: CS - 361</b>  <b>Course Title : Operating Systems-II</b> </p>		
Teaching Scheme: 03 Lect / week	No. of Credits: 2	Examination Scheme: IE : 15 marks UE: 35 marks
<b>Prerequisites</b> Concepts of Operating System, Processes and Threads Scheduling, Synchronization		
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>1. To understand the issue of Deadlocks in Process management.</li> <li>2. To understand the concept of File system management &amp; disk scheduling</li> <li>3. To study the concept of distributed and mobile operating systems</li> </ol>		
<b>Course Outcomes: After completion of this course students will be able to understand the concept of</b> <ol style="list-style-type: none"> <li>1. Management of deadlocks and File System by operating system</li> <li>2. Scheduling storage or disk for processes</li> <li>3. Distributed Operating System and its architecture and the extended features in mobile OS.</li> </ol>		
<b>Course Contents</b>		
<b>Chapter 1</b>	<b>Process Deadlocks</b>	<b>7 lectures</b>
<ul style="list-style-type: none"> <li>• System model</li> <li>• Deadlock Characterization – Necessary conditions, Resource allocation graph</li> <li>• Deadlock Methods- Prevention and Deadlock Avoidance - Safe state, Resource allocation graph algorithm, Banker's Algorithm</li> <li>• Deadlock Detection</li> <li>• Recovery from Deadlock – Process termination, Resource preemption</li> </ul>		
<b>Chapter 2</b>	<b>File system Management</b>	<b>6 lectures</b>
<ul style="list-style-type: none"> <li>• File concept , File attributes, File operations</li> <li>• Access Methods – Sequential, Direct, Other access methods</li> <li>• Directory overview, Single level directory, Two level directory, Tree structure directory, Acyclic graph directory, General graph directory</li> <li>• Allocation Methods – Contiguous allocation, Linked allocation, Indexed allocation</li> <li>• Free Space Management – Bit vector, Linked list, Grouping, Counting, Space maps</li> </ul>		
<b>Chapter 3</b>	<b>Disk scheduling</b>	<b>4 lectures</b>
<ul style="list-style-type: none"> <li>• Overview, Disk Structure</li> <li>• Disk Scheduling, FCFS Scheduling, SSTF Scheduling, Scan Scheduling-Scan Scheduling, Look Scheduling , Disk Management</li> </ul>		
<b>Chapter 4</b>	<b>Introduction to Distributed operating systems &amp; Architecture</b>	<b>11 lectures</b>
<ul style="list-style-type: none"> <li>• What is a distributed system, Design goals</li> <li>• Types of distributed systems</li> <li>• Architectural styles : Layered architectures , Object-based architectures, Resource-centered architectures</li> <li>• System architecture – Centralized organization, Decentralized organizations, peer-to-peer systems, Hybrid architectures.</li> </ul>		

<ul style="list-style-type: none"> <li>• Example architectures : Network file system(NFS), Web-based distributed systems</li> </ul>		
<b>Chapter 5</b>	<b>Mobile Operating Systems</b>	<b>7 lectures</b>
<ul style="list-style-type: none"> <li>• Introduction</li> <li>• Features</li> <li>• Special Constraints and Requirements of Mobile Operating System</li> <li>• Special Service Requirements</li> <li>• ARM &amp; Intel architectures – Power management</li> <li>• Mobile OS architectures – Underlying OS, kernel structure &amp; native level programming, Runtime issues, Approaches to power management</li> <li>• Commercial Mobile Operating Systems - Windows Mobile, iPhone OS (iOS), Android</li> <li>• A Comparative Study of Mobile Operating Systems (Palm OS, Android, Symbian OS, Blackberry OS, Apple iOS)</li> </ul>		
<b>Reference Books:</b>		
<p>1) Advanced Concepts in Operating Systems, M Singhal and NG Shivaratri, Tata McGraw Hill Inc, 2001 (Text Book)</p> <p>2) Operating System Concepts, Avi Silberschatz, Peter Galvin, Greg Gagne, Student Edition, Wiley Asia</p> <p>3) Operating Systems: Internals and Design Principles, William Stallings, Prentice Hall of India.</p> <p>4) Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI</p> <p>5) Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, New Delhi – 2012.</p> <p>6)A. Tannenbum, Herbert Bos, “Modern Operating systems”, Pearson Publication, 4<sup>th</sup> Edition</p> <p>7) A. Tannenbum, Maarten van Steen, “Distributed systems”, 3<sup>rd</sup> Edition</p> <p>8) Source wikipedia, Mobile operating systems, General books, LLC,2010</p>		