

PART A: Introduction			
Program: <b>Under Graduate</b>	Class: <b>B.Sc.</b>	Year: <b>First Year</b>	Session: <b>2025-26</b>
Subject: <b>Computer Science</b>			
1.	Course Code		
2.	Course Title	<b>C-3(TH): Operating System &amp; Office Tools</b>	
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational)	<b>Core Course</b>	
4.	Pre-Requisite (if any)	To study this course, Mathematics of 12 <sup>th</sup> standard is desirable.	
5.	Course Learning Outcomes (CLO)	<p>On completion of this course, learners will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand (<i>Level-2</i>) the fundamental concepts of operating systems, their functions, and architectures;</li> <li>2. Analyze (<i>Level-4</i>) process management, scheduling, concurrency, and memory management techniques;</li> <li>3. Understand (<i>Level-2</i>) the file systems, I/O management, security, and virtualization;</li> <li>4. Develop (<i>Level-6</i>) proficiency in state-of-the-art office productivity tools, including word processing, spreadsheets, presentations, database management, and collaboration tools;</li> <li>5. Explain (<i>Level-2</i>) India's contributions towards computing, knowledge structuring, and resource management techniques.</li> </ol> <p><i>Note: Level of Bloom's Taxonomy is mentioned in the brackets.</i></p>	
6.	Credit Value	<b>Theory -4 Credits</b>	
7.	Total Marks	Max. Marks: <b>30+70</b>	Min. Passing Marks: <b>35</b>
PART B: Content of the Course			
No. of Lectures (in hours per week): <b>04 Hrs. per week</b>			
Total No. of Lectures: <b>60 Hrs.</b>			
Module	Topics		No. of Lectures
I	<p><i>Introduction to Operating Systems:</i> Definition, Functions, Evolution, Types (Batch, Multiprogramming, Time-Sharing, Distributed, Real-Time, Embedded).</p> <p><i>Resource allocation concepts in Indian Philosophy:</i> Pancha Kosha theory - layered abstraction akin to OS design, Manuscript storage in ancient Indian libraries (Takshashila &amp; Nalanda) as an analogy for memory management.</p> <p><b><u>Suggested activities for experiential learning:</u></b></p> <ol style="list-style-type: none"> <li>1. Compare modern OS resource allocation techniques with the layered structure of Pancha Kosha.</li> <li>2. <u>Group Discussion &amp; Concept Mapping:</u> Explore how ancient manuscript storage systems parallel modern memory management.</li> <li>3. <u>Simulation Exercise:</u> Develop a simulation that models resource allocation algorithms (e.g., CPU scheduling) in an OS environment.</li> <li>4. <u>Conceptual Flowchart Development:</u> Create flowcharts that map the evolution of OS design, linking abstract layers to practical resource management.</li> </ol>		8

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II	<p><b>Process Management:</b> Process Concept, Process Scheduling (FCFS, SJF, Round Robin, Priority Scheduling), Threads, Inter-process Communication (IPC).</p> <p><i>Task scheduling in Vedic rituals:</i> Yagna sequences similar to scheduling algorithms, Efficient computation models in Indian astronomy (Aryabhata's planetary motion calculations).</p> <p><b><u>Suggested activities for experiential learning:</u></b></p> <ol style="list-style-type: none"> <li>1. <b><u>Simulation Modeling:</u></b> Develop a simulation of process scheduling (e.g., FCFS, SJF) and compare its performance with the sequential order observed in Vedic rituals.</li> <li>2. <b><u>Real-life Analogy:</u></b> Ask students to map everyday situations (e.g., waiting in a queue, dividing tasks among teammates) to process scheduling concepts.</li> <li>3. <b><u>Role-Playing Exercise (Core CS):</u></b> Organize a role-play where students act out process scheduling to understand priorities and time-sharing.</li> <li>4. <b><u>Thread Race Game:</u></b> Create a hands-on game where students simulate threads competing for CPU time. Use physical tokens or cards to represent tasks and resources.</li> </ol>	8
III	<p><b>Concurrency &amp; Synchronization:</b> Process Synchronization, Critical Sections, Deadlocks (Prevention, Avoidance, Detection), Semaphores, CPU Scheduling.</p> <p>Parallel execution concepts in Indian astronomical texts (e.g., Surya Siddhanta) compared to modern concurrent processing.</p> <p><b><u>Suggested activities for experiential learning:</u></b></p> <ol style="list-style-type: none"> <li>1. <b><u>Interactive Simulation:</u></b> Build a simulation to model concurrent process execution and explore synchronization techniques (e.g., semaphores, monitors).</li> <li>2. <b><u>Hands-On Lab:</u></b> Design and test synchronization protocols to resolve common issues like race conditions and deadlocks.</li> <li>3. <b><u>Role-Playing Activity:</u></b> Have students simulate process synchronization, with roles assigned as processes and synchronization tools.</li> <li>4. Organize a debate in which students argue the concept of "parallelism" in the <b><i>Surya Siddhanta</i></b> versus modern computational models.</li> <li>5. <b><u>Group Discussion:</u></b> Discuss how tasks can be divided and executed simultaneously to reduce overall execution time.</li> </ol>	8
IV	<p><b>Memory Management:</b> Memory Hierarchy, Virtual Memory, Paging, Segmentation, Fragmentation, Thrashing.</p> <p>Indexing &amp; storage techniques in ancient Indian texts (Rigveda's indexing method similar to hierarchical memory management).</p> <p><b><u>Suggested activities for experiential learning:</u></b></p> <ol style="list-style-type: none"> <li>1. <b><u>Simulation Project:</u></b> Develop a simulator for virtual memory management and paging, drawing analogies with ancient hierarchical indexing.</li> <li>2. <b><u>Comparative Research Assignment:</u></b> Investigate and present on the similarities between ancient manuscript organization and modern cache memory systems.</li> <li>3. <b><u>Visualization Workshop:</u></b> Design flowcharts or diagrams that illustrate memory allocation and fragmentation concepts.</li> <li>4. <b><u>Hands-On Implementation:</u></b> Implement a memory management algorithm to study fragmentation and allocation strategies in a simulated OS environment.</li> </ol>	8

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V	<p><b>File Systems &amp; I/O Management:</b> File Organization, Allocation Methods (Contiguous, Linked, Indexed), Directory Structure, Disk Scheduling (FCFS, SSTF, SCAN, LOOK). Knowledge documentation in Indian scriptures (Palm-leaf manuscripts stored using structured indexing).</p> <p><b><u>Suggested activities for experiential learning:</u></b></p> <ol style="list-style-type: none"> <li>1. <b><u>File System Design Project:</u></b> Design file system architecture inspired by the organized storage of ancient manuscripts.</li> <li>2. <b><u>Lab Exercise:</u></b> Simulate different file allocation methods (contiguous, linked, indexed) using available tools.</li> <li>3. <b><u>Group Project:</u></b> Develop a directory management system incorporating modern OS file system concepts.</li> <li>4. <b><u>Case Study Discussion:</u></b> Analyze real-world file system challenges and propose solutions, integrating both historical insights and modern techniques.</li> </ol>	8
VI	<p><b>Office Productivity Tools:</b> Word Processing, Spreadsheets, Presentations, Database Management, Email &amp; Collaboration Tools.</p> <p>Emphasizing latest versions of widely used office productivity suites such as MS Office 365 (with AI support), Google Workspace, LibreOffice, and any emerging tools. The focus will be on adaptability to evolving digital technologies.</p> <p><b><u>Suggested activities for experiential learning:</u></b></p> <ol style="list-style-type: none"> <li>1. <b><u>Tool Comparison Workshop:</u></b> Compare different office productivity suites (e.g., document editors, spreadsheets, presentations) based on functionality and usability.</li> <li>2. <b><u>Integrated Project:</u></b> Develop a comprehensive project that requires the creation and management of documents, spreadsheets, and presentations to simulate real-world business scenarios.</li> <li>3. <b><u>Collaborative Simulation:</u></b> Organize a virtual group exercise using modern collaboration tools to solve a practical problem.</li> <li>4. <b><u>Expert Session:</u></b> Invite an industry professional to demonstrate advanced features and discuss emerging trends in digital productivity.</li> </ol>	8
VII	<p><b>Security &amp; Virtualization:</b> Basics of Computer Security, User Authentication, Access Control, Cloud Computing, Virtual Machines, Containers.</p> <p>Ancient Indian encryption techniques (Kautilya's Arthashastra on cryptography), Role of security in knowledge preservation (e.g., coded messages in ancient war strategies).</p> <p><b><u>Suggested activities for experiential learning:</u></b></p> <ol style="list-style-type: none"> <li>1. <b><u>Encryption Lab:</u></b> Implement basic encryption and decryption algorithms inspired by ancient techniques and compare with modern methods.</li> <li>2. <b><u>Virtualization Simulation:</u></b> Develop a simulation to understand virtualization concepts and the isolation of virtual environments.</li> <li>3. <b><u>Security Policy Workshop:</u></b> Draft a security policy for a hypothetical organization, integrating both modern authentication protocols and historical secure communication practices.</li> <li>4. <b><u>Case Study Analysis:</u></b> Examine historical instances of secure communication and relate them to contemporary security challenges.</li> </ol>	8



VIII	<p><b>Indian Contributions to Operating Systems &amp; Computing:</b> Achievements of Raj Reddy (AI &amp; Speech Recognition), Pravin Bhagwat (Wi-Fi Protocols), Satyam Priyadarshy (Cloud Computing), and India's Role in Open Source. India's innovations in software development, networking, and artificial intelligence.</p> <p><b><u>Suggested activities for experiential learning:</u></b></p> <ol style="list-style-type: none"> <li>1. <b><u>Research Presentation:</u></b> Prepare detailed presentations on the achievements of key Indian computing pioneers and their impact on modern OS development.</li> <li>2. <b><u>Innovation Workshop:</u></b> Organize a mini-hackathon where students develop small projects inspired by the innovations of these pioneers.</li> <li>3. <b><u>Panel Discussion:</u></b> Host a panel with industry experts and academicians to discuss the influence of Indian contributions on global computing trends.</li> <li>4. <b><u>Documentary Screening &amp; Discussion:</u></b> Watch a documentary on India's technological advancements, followed by a reflective group discussion on lessons learned and future prospects.</li> </ol>	4
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PART C: Learning Resources	
Textbooks, Reference Books, Other Resources	
<p><b><u>Suggested Readings:</u></b></p> <ul style="list-style-type: none"> <li>• Silberschatz, Galvin, Gagne: Operating System Concepts, Wiley.</li> <li>• William Stallings: Operating Systems: Internals &amp; Design Principles, Pearson.</li> <li>• Andrew S. Tanenbaum: Modern Operating Systems, Pearson.</li> <li>• Rajaraman: Fundamentals of Computers, PHI Learning.</li> <li>• ITL Education: Introduction to Information Technology, Pearson.</li> <li>• S. (2004). Ancient Indian Knowledge Systems and Their Relevance to Modern Technology.</li> <li>• Ghosh, A. (2001). Indian Philosophy and Organizational Systems.</li> <li>• Nair, A. (2015). Indian Innovators in Computing.</li> <li>• Rao, S. (2013). Technological Contributions from India.</li> <li>• Mehta, P. (2006). Cryptography in Arthashastra.</li> <li>• Desai, V. (2012). Ancient Security Practices and Modern Cryptography.</li> <li>• Banerjee, S. (2002). Documentation Systems in Ancient India.</li> <li>• Singh, R. (2008). File Systems: An Indian Historical Perspective.</li> <li>• Kumar, D. (2007). Ancient Indexing Methods and Modern Memory Systems.</li> <li>• Jain, M. (2003). Memory and Manuscripts: An Indian Perspective.</li> <li>• Reddy, N. (2010). Parallelism in Ancient Indian Astronomy.</li> <li>• Menon, K. (2008). Concurrency Concepts in Historical Context.</li> <li>• Gupta, P. (1999). Aryabhata's Contributions to Astronomy and Computing.</li> <li>• Sharma, R. (2005). Ancient Scheduling Techniques in Indian Rituals.</li> </ul> <p><b><u>Suggested online Learning Resources:</u></b></p> <ul style="list-style-type: none"> <li>○ NPTEL Course: Operating System Principles – NPTEL Link</li> <li>○ Office Tools (Latest MS Office 365, AI Support)</li> <li>○ <a href="https://nptel.ac.in/courses/106106144">https://nptel.ac.in/courses/106106144</a></li> <li>○ <a href="https://archive.nptel.ac.in/courses/106/105/106105214/">https://archive.nptel.ac.in/courses/106/105/106105214/</a></li> <li>○ <a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==</a></li> </ul>	

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Part D: Assessment and Evaluation		
<b>Suggested Continuous Evaluation Methods:</b> Maximum Marks: <b>100</b> Continuous Comprehensive Evaluation (CCE): <b>30</b> Marks University Exam (UE): <b>70</b> Marks		
<b>Internal Assessment:</b> Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	<b>Total Marks: 30</b>
<b>External Assessment:</b> University Exam (UE) Time: 03.00 Hours	Section (A): Objective type Section (B): Short Questions Section (C): Long Questions	<b>Total Marks: 70</b>

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Session: <b>2025-26</b>			
Subject: <b>Computer Science</b>			
1.	Course Code		
2.	Course Title	<b>C-3(PR): Operating System &amp; Office Tools (Lab)</b>	
3.	Course Type (Core Course/Elective/Generic Elective/Vocational)	<b>Core Course</b>	
4.	Pre-Requisite (if any)	To study this course, Mathematics of 12 <sup>th</sup> standard is desirable.	
5.	Course Learning Outcomes(CLO)	<p>On completion of this course, learners will be able to:</p> <ol style="list-style-type: none"> <li>1. Perform (<i>Level-6</i>) the simulation for process scheduling, disk-scheduling, memory management techniques.</li> <li>2. Perform (<i>Level-6</i>) the dead-lock detection using modeling.</li> <li>3. Perform (<i>Level-6</i>) the file-handling using Linux commands and shell scripting.</li> <li>4. Perform (<i>Level-6</i>) the formatting of text on various word processing tools.</li> <li>5. Create (<i>Level-6</i>) spreadsheet using formula and pivot tables.</li> <li>6. Create (<i>Level-6</i>) and manipulate (<i>Level-3</i>) the data using database tools.</li> <li>7. Create (<i>Level-6</i>) presentations using AI tools in quick and smart way.</li> <li>8. Manage (<i>Level-6</i>) online-meetings through Google meet, MS-teams, Zoom etc. applications.</li> </ol> <p><i>Note: Level of Bloom's Taxonomy is mentioned in the brackets</i></p>	
6.	Credit Value	<b>Practical - 2 Credits</b>	
7.	Total Marks	<b>Max. Marks: 100</b>	<b>Min. Passing Marks: 35</b>

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PART B: Content of the Course		
No. of Lab. Practical (in hours per week): <b>2 Hrs. per week</b>		
Total No. of Labs: <b>60 Hrs.</b>		
	<b>Suggestive list of Practical</b>	<b>No. of Labs.</b>
	<p><b>I - Office Tools:</b></p> <ol style="list-style-type: none"> <li>1 <i>Word Processing Tools:</i> Document formatting, referencing, macros (Using latest versions of MS Word, Google Docs, LibreOffice). <ul style="list-style-type: none"> <li>• Create a document and apply different Editing options.</li> <li>• Create Banner for your college.</li> <li>• Design a Greeting Card using Word Art for different festivals.</li> <li>• Design your Bio data and use page borders and shading.</li> <li>• Create a document and insert header and footer, page title, date, time, apply various page formatting features etc.</li> <li>• Implement Mail Merge.</li> <li>• Insert a table into a document and try different formatting options for the table.</li> </ul> </li> <li>2 <i>Spreadsheet Tools:</i> Advanced formulas, data visualization, pivot tables (Using latest Excel, Google Sheets). <ul style="list-style-type: none"> <li>• Design your class Time Table.</li> <li>• Prepare a Mark Sheet of your class result.</li> <li>• Prepare a Salary Slip of an employee of an organization.</li> <li>• Prepare a bar chart &amp; pie chart for analysis of Election Results.</li> <li>• Prepare a generic Bill of a Super Market.</li> <li>• Work on the following exercises on a Workbook: <ul style="list-style-type: none"> <li>• Copy an existing Sheet</li> <li>• Rename the old Sheet</li> <li>• Insert a new Sheet into an existing Workbook</li> <li>• Delete the renamed Sheet.</li> </ul> </li> <li>• Prepare an Attendance sheet of 10 students for any 6 subjects of your syllabus. Calculate their total attendance, total percentage of attendance of each student &amp; average of attendance.</li> <li>• Create a worksheet of Students list of any 4 faculties and perform following database functions on it. <ul style="list-style-type: none"> <li>○ Sort data by Name</li> <li>○ Filter data by Class</li> <li>○ Subtotal of no. of students by Class.</li> </ul> </li> </ul> </li> <li>3 <i>Presentation Tools:</i> AI-assisted slide design, animation, transitions (Using PowerPoint, Google Slides). <ul style="list-style-type: none"> <li>• Design a presentation of your institute using auto content wizard, design template and blank presentation.</li> <li>• Design a presentation illustrating insertion of pictures, Word Art and ClipArt.</li> <li>• Design a presentation, learn how to save it in different formats, copying and opening an existing presentation.</li> <li>• Design a presentation illustrating insertion of movie, animation and sound.</li> <li>• Illustrate use of custom animation and slide transition (using different effects).</li> <li>• Design a presentation using charts and tables of the marks obtained in class.</li> </ul> </li> </ol>	



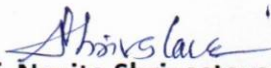
<p>4 <i>Database Tools</i>: Create and manage databases in MS Access or cloud-based tools.</p> <p>5 <i>Collaboration Tools</i>: Hands-on with Microsoft Teams, Slack, Zoom, Google Meet, and emerging AI-powered collaboration tools</p> <p><b>II -Operating System:</b></p> <p>1 Hands-on process scheduling simulation (FCFS, Round Robin, Priority Scheduling).</p> <p>2 Deadlock detection &amp; prevention simulation using system modelling.</p> <p>3 Memory management simulation – Implement paging &amp; segmentation.</p> <p>4 Disk scheduling algorithms – SSTF, SCAN, LOOK using programming.</p> <p>5 Linux Commands &amp; Shell Scripting – File handling, user management.</p>	
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#### PART D: Assessment and Evaluation

##### Suggested Continuous Evaluation Methods:

<u>Internal Assessment</u>	<u>Marks</u>	<u>External Assessment</u>	<u>Marks</u>
Class Interaction/Quiz	NIL	Viva Voce on Practical (20 marks)	100
Attendance		Practical Record File (20 marks)	
Assignments (Charts/Model/Seminars / Technology Dissemination/ Excursion/ Lab visit/ Industrial Visit)		Table Work / Exercise Assigned (60 marks)	
	Total Marks: 100		

  
**Prof. Navita Shrivastava**  
**Chairman Board of Studies**