

Programme Title	B.E/ B.Tech (CS,IS,IT,Robotics Engineering)	Semester	1																		
Course Title	Operating Systems	Course Code	10ABTEC22115																		
Course Credits	4	Credit Hours	75																		
1. Course Description This course introduces the fundamental concepts of operating systems, exploring their evolution, types, and essential services. Students will delve into process management, memory management, file system management, device management, networking, and security. The course will also cover system calls and API, as well as the different architectural structures of operating systems. By the end of this course, students will have a solid understanding of how operating systems function and interact with hardware and software components.																					
2. Goals <ul style="list-style-type: none">• Understand the fundamental concepts, principles, and evolution of operating systems.• Analyze the various services provided by operating systems and their role in managing system resources.• Evaluate different memory management techniques and their impact on system performance.• Implement and manage file systems efficiently, considering factors like organization, access control, and performance optimization.• Assess security risks and vulnerabilities in operating systems and implement appropriate measures to protect systems and data...																					
3. Objectives of Development <ul style="list-style-type: none">• Gain knowledge of the fundamental concepts of operating systems, including their definition, evolution, types, and services.• Explore the different processes involved in operating system management, such as process scheduling, memory management, file system management, and security.• Compare the various techniques and algorithms used in operating systems, including memory allocation, process synchronization, and disk scheduling.																					
4. Course Outcome <table><tr><th>COs</th><th>Course outcomes</th><th>RBT</th></tr><tr><td>CO1</td><td>Understand the basic structure and functions of an operating system.</td><td>L1</td></tr><tr><td>CO2</td><td>Analyze different process management techniques and scheduling algorithms.</td><td>L2</td></tr><tr><td>CO3</td><td>Evaluate the effectiveness of different page replacement algorithms (FIFO, LRU, Optimal) in managing virtual memory and preventing thrashing.</td><td>L2</td></tr><tr><td>CO4</td><td>Implement and compare different file allocation methods (indexed allocation, linked allocation) in terms of efficiency and performance.</td><td>L3</td></tr><tr><td>CO5</td><td>Identify common threats and vulnerabilities in operating systems and propose appropriate security measures to mitigate them</td><td>L2</td></tr></table>				COs	Course outcomes	RBT	CO1	Understand the basic structure and functions of an operating system.	L1	CO2	Analyze different process management techniques and scheduling algorithms.	L2	CO3	Evaluate the effectiveness of different page replacement algorithms (FIFO, LRU, Optimal) in managing virtual memory and preventing thrashing.	L2	CO4	Implement and compare different file allocation methods (indexed allocation, linked allocation) in terms of efficiency and performance.	L3	CO5	Identify common threats and vulnerabilities in operating systems and propose appropriate security measures to mitigate them	L2
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5. Teaching Methods Activity based learning, Flip classroom, Projects, PPT																					
6. Teaching Plan <table><tr><th>Week</th><th>Topic</th><th>Hours</th><th>Teaching Methods/ Multimedia</th></tr><tr><td>1-4</td><td>MODULE-1: Introduction to Operating Systems Introduction: Definition, evolution, types of operating</td><td>15 Hours 4 Hours/ Week</td><td>PPT, Handouts, Smart Board, Case study, Video</td></tr></table>				Week	Topic	Hours	Teaching Methods/ Multimedia	1-4	MODULE-1: Introduction to Operating Systems Introduction: Definition, evolution, types of operating	15 Hours 4 Hours/ Week	PPT, Handouts, Smart Board, Case study, Video										
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	<p>systems (batch, interactive, real-time, distributed, embedded). Operating System Services: Process management, memory management, file management, device management, networking, security. System Calls: Introduction, types of system calls, API (Application Programming Interface). System Structures: Layered architecture, monolithic vs. microkernel architecture.</p>		
5-8	<p>MODULE-2: : Process Management</p> <p>Process Concept: Process definition, process states, process control block (PCB). Process Scheduling: Preemptive vs. non-preemptive scheduling, scheduling algorithms (FCFS, SJF, Priority, Round Robin). Inter-process Communication (IPC): Shared memory, message passing, semaphores, mutexes. Process Synchronization: Critical section problem, semaphores, mutexes, monitors.</p>	<p>15 Hours</p> <p>4 Hours/ Week</p>	<p>PPT, Handouts, Smart Board, Case study, Video</p>
9-12	<p>MODULE-3: Memory Management</p> <p>Memory Management Techniques: Contiguous allocation, paging, segmentation. Virtual Memory: Address space and memory space, demand paging, page replacement algorithms (FIFO, LRU,</p>	<p>15 Hours</p> <p>4 Hours/ Week</p>	<p>PPT, Handouts, Smart Board, Case study, Video</p>

	Optimal).Thrashing: Causes, detection, and prevention.Memory Protection: Memory segmentation and paging for protection, memory access control.		
12-16	MODULE-4: File System Management File System Concept: File organization, directory structure, access control mechanisms.File System Implementation: Indexed allocation, linked allocation, i-nodes.File System Operations: Creating, deleting, opening, closing, reading, writing, seeking. Disk Scheduling: FCFS, SCAN, C-SCAN scheduling algorithms.	15 Hours 4 Hours/ Week	PPT, Handouts, Smart Board, Case study, Video
16-20	,	15 Hours 4 Hours/ Week	PPT, Handouts, Smart Board, Case study, Video
7. Technology Tools <ul style="list-style-type: none"> VirtualBox, Programming and Debugging Tools 			
8. Skill Based training Essential Skills <ul style="list-style-type: none"> Programming Skills: Proficiency in programming languages like C, C++, or Python is essential for understanding and working with operating systems. Problem-Solving and Debugging: The ability to identify and resolve issues in operating system environments is crucial. System Administration: Knowledge of system administration tasks, such as user management, file systems, and network configuration. Networking Concepts: Understanding of networking protocols, network architectures, and troubleshooting techniques. Security Awareness: Familiarity with security threats, vulnerabilities, and best practices for protecting operating systems. 			
9. Areas of Employability System administration, DevOps, Network engineering			
10. Inter-department			

This course is the core course for Computer Science Engineering.
11. Skill Mentoring Providing constant guidance to do project-based activity and research, actively listening to student's feedback regarding their understanding of the concepts.
12. Quantitative Skill Assessment Continuous Internal Assessment (CIA) will be done through IA quiz, Case Studies, Projects, Presentation and Examination.
13. Mentorship Model Peer Mentoring (Mentor – Mentee)
14. Potential Employers Intel, TCS, HCL or Any startups
14.1 National Employers <ul style="list-style-type: none"> • Indian IT Giants: Infosys, TCS, Wipro, HCL Technologies, Tech Mahindra • Indian Startups: Flipkart, Paytm, Ola, Byju's, Zomato • Government Organizations: Indian Space Research Organisation (ISRO), National Informatics Centre (NIC), Bharat Electronics Limited (BEL) • Research Institutions: Indian Institute of Science (IISc), Indian Institute of Technology (IITs), National Institute of Technology (NITs)
14.2 International Employers Google, Microsoft, Apple, Amazon, IBM, Oracle
15 Evaluation Method Formative and Summative Assessment methods
16 Teaching Materials and Methods Handouts, E-Materials, E-Platform to execute coding, Lab Manuals, E-Books
16.1 Text and Main Document <ul style="list-style-type: none"> • Operating Systems: Principles and Practice by Abraham Silberschatz, Peter Galvin, and Greg Gagne • Modern Operating Systems by Andrew Tanenbaum • The Design of the UNIX Operating System by Maurice J. Bach
16.2 Documents for further study <ul style="list-style-type: none"> • Linux Kernel Documentation • Windows Internals • FreeBSD Documentation
16.3 E- Learning <ul style="list-style-type: none"> • Coursera: https://www.coursera.org/ • edX: https://www.edx.org/ • Udemy: https://www.udemy.com/
16.4 Online and Print Magazines <ul style="list-style-type: none"> • OSNews: A news website covering operating systems, including Linux, Windows, macOS, and others. • The Register: A technology news website with a section dedicated to operating systems and server hardware. • Ars Technica: A technology news website with in-depth articles on operating systems and other topics.
16.5 Online and Print Journals <ul style="list-style-type: none"> • ACM Transactions on Computer Systems (TOCS) • Journal of Systems and Software

16.6 Videos

- **Yale University - Introduction to Operating Systems:** <https://www.youtube.com/watch?v=dOiA2nNJpc0>
- **MIT 6.033: Introduction to Computer Systems:** <https://www.youtube.com/playlist?list=PL4B-zKM9nXilHHcXtSTF-YRxV4Pef-MQw>
- **Stanford CS140: Operating Systems:** <https://www.youtube.com/watch?v=Pg0FwcPhC2E>

17 What are the likely improvements suggested for the course over the next 12 months?

Curriculum Enhancements

- **Incorporate Cloud Computing Concepts:** Discuss the role of operating systems in cloud environments and cloud-based services.
- **Focus on Containerization and Virtualization:** Explore the use of containers and virtualization technologies in modern operating systems.
- **Expand Coverage of Security Topics:** Include more in-depth discussions on security threats, vulnerabilities, and best practices.
- **Update the Course Content:** Regularly review and update the course content to reflect the latest advancements in operating system technology.

Teaching Methods

- **Hands-On Labs:** Provide more opportunities for students to practice with real-world operating system configurations and troubleshooting.
- **Case Studies:** Use case studies to illustrate real-world applications of operating system concepts.
- **Group Projects:** Assign group projects that require students to work together on a specific operating system task or project.
- **Guest Lectures:** Invite industry experts to share their experiences and insights on current trends in operating systems.

Assessments

- **Project-Based Assessments:** Evaluate students' understanding through project-based assessments that require them to apply their knowledge to real-world scenarios.
- **Peer Evaluation:** Incorporate peer evaluation to encourage students to provide feedback and support each other.
- **Online Quizzes and Exams:** Utilize online tools for quizzes and exams to provide immediate feedback and streamline the assessment process.

Additional Considerations

- **Student Feedback:** Regularly solicit feedback from students to identify areas for improvement and tailor the course to their needs.
- **Faculty Development:** Encourage faculty members to participate in professional development activities to stay updated on the latest teaching methods and technologies.
- **Technology Integration:** Explore the use of technology tools to enhance the learning experience, such as virtual labs, online simulations, and interactive learning platforms.
- **Interdisciplinary Collaboration:** Collaborate with other departments to offer interdisciplinary courses that integrate operating systems concepts with other fields, such as computer networks, database systems, or artificial intelligence.
- **Career Development Support:** Provide students with career guidance and resources, including

job search workshops, mock interviews, and networking opportunities.

Course Designed By: Prof. Ravi Kumar M

Signature of the HOD

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