

**UG Detailed Syllabus Template**  
**Operating Systems**

<b>Course Code</b>	<b>21CS51</b>	<b>Course type</b>	PCC	<b>Credits L-T-P</b>	3 – 0 - 0
<b>Hours/week: L - T- P</b>	3 – 0 – 0			<b>Total credits</b>	<b>3</b>
<b>Total Contact Hours</b>	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			<b>CIE Marks</b>	100
<b>Flipped Classes content</b>	10 Hours			<b>SEE Marks</b>	100

<b>Course learning objectives</b>	
1.	To introduce the functions of operating system, design, structure and associated system calls
2.	To study and analyze various scheduling algorithms and process synchronization techniques
3.	To develop an understanding about deadlocks and deadlock recovery techniques.
4.	To discuss and realize the importance of memory management techniques.
5.	To gain the knowledge of file systems and secondary storage structures.

**Pre-requisites** : Basic knowledge of computer concepts & programming, Computer Organization.

<b>Unit – I</b>	<b>Contact Hours = 8 Hours</b>
<b>Introduction to Operating System:</b> System structures: What operating systems do; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Operating System Services; System calls; Operating System structure; System boot. <b>Introduction to UNIX File System:</b> Inside UNIX, Internal and External Commands, Command structure. <b>Case Study:</b> Android Operating System / iOS	

<b>Unit – II</b>	<b>Contact Hours = 8 Hours</b>
<b>Process Management:</b> : Process concept; Process scheduling; Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms. <b>The Process:</b> Understanding the process, How a process is created, the login shell, init, internal and external commands, ps. <b>Case Study:</b> <b>OSSim Simulation Tool</b>	

<b>Unit – III</b>	<b>Contact Hours = 8 Hours</b>
<b>Process Synchronization:</b> : Synchronization: The Critical section problem; Peterson’s solution; Semaphores, <b>Classical problems of synchronization: The Dining-Philosophers Problem.</b> <b>Deadlocks:</b> <b>Deadlocks:</b> System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.	

<b>Unit – IV</b>	<b>Contact Hours = 8 Hours</b>
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**Memory Management:** Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement;

<b>Unit – V</b>	<b>Contact Hours = 8 Hours</b>
<b>File System:</b> File System: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Protection. <b>The File System:</b> The parent child relationship, The UNIX file system, Absolute Pathnames, Relative Pathnames, pwd, cd, mkdir, rmdir, cp, rm, mv, cat. File Attributes: ls, ls-l, ls-d, file permissions, chmod.	

#### Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Books	
	<b>Text Books:</b>
1.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Principles”, Wiley India, 6th edition and onwards.
2.	Sumitabha Das: “YOUR UNIX – The Ultimate Guide” , Tata McGraw Hill, 23rd reprint , 2012 and onwards.
	<b>Reference Books:</b>
1.	Gary Nutt, “Operating System”, Pearson Education, 2nd edition and above.
2.	Harvey M Deital, “Operating system”, Addison Wesley, 2nd edition and above.
3.	D.M Dhamdhare, “Operating System”, “A concept based Approach”, Tata McGraw- Hill, 2nd edition and onwards
4.	Behrouz A. Forouzan and Richard F. Gilberg: “UNIX and Shell Programming “, Cengage Learning, 2005 and onwards.
	<b>E-resources (NPTEL/SWAYAM.)/COURSERA</b>
1.	<a href="https://onlinecourses.nptel.ac.in/">https://onlinecourses.nptel.ac.in/</a> <a href="#">Tentative Course List (July - Dec 2023) - Google Drive</a>
2.	<a href="https://www.coursera.org/specializations/codio-introduction-operating-systems">https://www.coursera.org/specializations/codio-introduction-operating-systems</a>
3.	<a href="#">Lectures on Operating Systems (iitb.ac.in)</a>

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)

4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)				
At the end of the course, the student will be able to (Highlight the <b>action verb</b> representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	<b>Explain</b> the computer system resources and the role of an operating system in managing those resources	Un	1	1
2.	<b>Develop</b> applications keeping concurrency and synchronization, semaphores, Monitors, shared memory, mutual exclusion, process scheduling services of general operating system and do the case study on OSSim Simulation Tool.	Ap	1,2,5	1,2
3.	<b>Describe</b> and <b>analyze</b> memory management, file management and secondary Memory Management techniques.	Ap	2,5	1,2
4.	<b>Discuss</b> UNIX shell commands for file handling , process control and do the case study on on Android Operating System / iOS.	Un	1,2	1,2
5.	<b>Apply</b> the learnings inculcated throughout the course and present a course seminar or <b>develop</b> a course project.	An	1,2,5,12	1,2,3

#### Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Online Quiz	Addition of two OBAs/ Course	Course Seminar	Total Marks
Marks	25+25 = 50	4* 5 marks = 20	10+10 =20	10	100
<b>OBA - Open Book Assignment</b> <b>Minimum score to be eligible for SEE: 40 OUT OF 100</b>					

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	<b>Minimum marks required in SEE to pass:</b> Score should be $\geq 35\%$ , however overall score of CIE + SEE should be $\geq 40\%$ .
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	✓												✓		
2	✓	✓			✓								✓	✓	
3		✓			✓								✓	✓	
4	✓	✓											✓	✓	
5	✓	✓			✓							✓	✓	✓	✓
Tick mark the CO, PO and PSO mapping															

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	<b>Continuous Improvement:</b> Continuous improvement is an ongoing process of improvement of products, services, and processes with the help of innovative ideas. <b>Customer Service :</b> Customer service is the process of offering assistance to all the current and potential customers -- answering questions, fixing problems, and providing excellent service	Product based companies	Software Developer, Software engineer, Software Analyst System Engineer Operations Systems Specialist

Name & Signature of Faculty members involved in designing the syllabus

- 1.Prof Ranjana Battur
2. Prof Seena Kalghatgi

Name & Signature of Faculty members verifying/approving the syllabus

1. Dr. Sanjeev Sannakki
2. Dr. Pavan Kunchur