

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING - CYBER SECURITY

COURSE MODULE OF THE SUBJECT TAUGHT FOR THE SESSION 2026-27- (ODD SEM)

Course Syllabus with CO's

Faculty Name: Ms. Sandhya G			Academic Year: 2026 - 2027					
Department: Computer Science & Engineering - Cyber Security								
Course Code	Course Title	Core / Elective	Prerequisite	Contact Hours				Total Hrs
				L	T	P	S	Sessions
1BCS304	OPERATING SYSYTEMS	Core	Computer organization and architecture, Programming fundamentals.	3				42T
Course Outcomes	At the end of the course, the student will be able to: 1. Recall the structure, functions, and services of an operating system. 2. Explain process management concepts, CPU scheduling algorithms, and process synchronisation mechanisms. 3. Apply appropriate CPU scheduling algorithms and process synchronisation techniques to solve operating system problems. 4. Apply memory management techniques and deadlock-handling strategies to ensure efficient resource utilization. 5. Explain file system organisation and secondary storage management techniques. 6. Describe information protection mechanisms, security principles, and access control methods in operating systems.							
Topics Covered as per Syllabus								
Module-1								
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management. Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Textbook 1: Chapter – 1 (1.1-1.8), 2 (2.2-2.7) Number of Hours: 09								
Module-2								
Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication communication. Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling. Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1,4.3,4.4,4.6), 5 (5.1 -5.5)Number of Hours: 08								

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Module-3

Process Synchronization: Background, The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization.

Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Textbook 1: Chapter – 6 (6.1-6.4, 6.6, 6.7), 7 (7.1 -7.7) Number of Hours: 09

Module-4

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6) Number of Hours: 08

Module-5

File System: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing.

Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

Mass Storage Structure: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management.

Textbook 1: Chapter – 10 (10.1-10.5), 11 (11.1-11.5), 12 (12.1-12.5) Number of Hours: 08

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Textbooks:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles, 9th edition, Wiley-India, 2015.

Reference books / Manuals:

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhare, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Web links and Video Lectures (e-Resources):

1. Introduction to Operating System: <https://youtu.be/mXw9ruZaxzQ>
2. Different Types of Operating Systems: https://youtu.be/vBURt97EkA_3
3. Process Synchronisation in Operating System: https://www.youtube.com/watch?v=783KAB-tuE4&list=PLIemF3uozcAKTgsCij82voMK3TMR0YE_f

Introduction to Unix: <https://infyspringboard.onwingspan.com/web/en/login>

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. Case-Based Teaching
2. Simulation and Virtual Labs:
Operating System Lab: https://erpjietuniverse.in/virtual_lab/Operating_system/labs/index.html
3. ICT-Enabled Teaching
4. Peer teaching/learning

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Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the CIE, a student must score at least **40% of 50 marks, i.e., 20 marks.**
- To pass the SEE, a student must score at least **35% of 50 marks, i.e., 18 marks.**

Notwithstanding the above, a student is considered to have **passed the course**, provided the combined total of CIE and SEE is at least **40 out of 100 marks.**

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal Evaluation CIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests (IA)** shall be conducted, carrying a total of **25 marks.**

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks.**

It is recommended to include a **maximum of two learning activities** as part of the CCA to foster the **holistic development of students.**

These activities shall be:

Sl. No.	Name of the Learning activity	Maximum Marks
1.	Implementation of Operating System Concepts using C Programming	25

1. Implementation of Operating System Concepts using C Programming List of Problems:

- Develop a C program to implement the Process system calls (fork (), exec(), wait(), create process, terminate process)
- Simulate the following CPU scheduling algorithms to find the turnaround time and waiting time
 - FCFS
 - SJF
 - Round Robin
 - Priority.
- Develop a C program to simulate producer-consumer problem using semaphores.
- Develop a C program that demonstrates interprocess communication between a reader process and a writer process. Use mk fifo, open, read, write, and close APIs in your program.
- Develop a C program to simulate Banker's Algorithm for Deadlock Avoidance.
- Develop a C program to simulate the following contiguous memory allocation techniques:
 - Worst fit
 - Best fit
 - First fit.
- Develop a C program to simulate page replacement algorithms:
 - FIFO
 - LRU
- Simulate following file organization techniques:
 - Single level directory
 - Two level directory
- Develop a C program to simulate the linked file allocation strategies.
- Develop a C program to simulate SCAN disk scheduling algorithm.

Note: At the end of the course, the students need to submit the report on conduction of the activity with relevant data to the course instructor. Evaluation is for 25 marks.

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Rubrics for Learning Activity:

Criteria/ Scale	Superior (5)	Good (4)	Fair (3)	Needs Improvement (2)	Unacceptable (1)
Understanding of OS Concept (CO1, CO2 /PO1,PO2)	Demonstrates complete understanding of the OS concept and correctly identifies the appropriate algorithm/technique.	Demonstrates very good understanding with negligible errors.	Demonstrates adequate understanding with minor misconceptions.	Shows limited understanding ; requires significant guidance.	Unable to understand the OS concept.
Algorithm Design (CO2, CO3, CO4 /PO2,PO3)	Designs an efficient and logically correct algorithm/flow for the problem.	Algorithm is correct with minor improvements possible.	Algorithm is mostly correct but lacks optimization.	Algorithm is partially correct with logical errors.	Unable to design a suitable algorithm.
C Program Implementation (CO1-CO5 /PO1,PO3)	Implements the solution completely in C with correct syntax, modular programming, and appropriate data structures.	Program executes correctly with minor coding issues.	Program works for most cases with moderate errors.	Program executes partially with several errors.	Unable to implement the solution in C.
Output Correctness and Analysis (CO3, CO4, CO5 /PO2, PO4)	Produces correct results for all test cases and accurately analyzes the outcome.	Correct output for most test cases with minor analysis errors.	Produces acceptable output for standard cases.	Output is partially correct with incorrect analysis.	Incorrect output or no meaningful analysis.
Code Quality and Documentation (CO3- CO6 /PO2,PO4)	Code is well-structured, properly indented, commented, and follows coding standards.	Good coding style with few documentation issues.	Adequate documentation and readability.	Poor documentation and inconsistent coding style.	No documentation; difficult to understand code.

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Term Work (TW) and Self Learning (SL) components in Number of Hours per semester		
Term work (includes assignments, seminars, micro projects, industrial visits, any other student learning activities etc.)		
Sl. No.	Term Work (TW) Activity	Number of Hours / Semester
1.	Implementation of Operating System Concepts Using C Programming	30
SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.		
Sl. No.	Self-Learning (SL) Activity	Number of Hours / Semester
1	Springboard Certification on: Introduction to Unix	18

Continuous Internal Evaluation (CIE)
1. The CIE marks shall be decided based on internal tests and other outcome-based activities. The continuous internal evaluation shall be carried out by the teacher handling the course. 2. Out of 50 marks earmarked for CIE, 25 marks shall be assigned for internal tests. The first test shall be conducted after completing two modules of the syllabus and the second one after completing the remaining three modules. 3. The remaining 25 marks shall be assigned for Continuous Course Assessment (CCA), conducted as per the rubrics listed in the assessment section of the respective syllabus. 4. A student shall obtain a minimum of 40% marks or 20 out of 50 marks allotted to CIE to become eligible to appear for the SEE.
Passing requirement in SEE
1. For a pass in the Semester End Examination (SEE), a student shall secure a minimum of 35 marks out of 100. 2. For the declaration of a pass grade, the sum of the Continuous Internal Evaluation (CIE) marks (out of 50) marks and the SEE marks scaled down to 50 shall be greater than or equal to 40 marks. 3. If the total (CIE + SEE) is less than 40 marks, the student shall be awarded the grade 'F' (Fail).

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The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

Subject Code:	1BCS304	TITLE: OPERATING SYSTEMS						Faculty Name:	Ms. Sandhya G			
List of Course Outcomes	Program Outcomes											Total
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	
CO-1	3	2	-	-	-	-	-	-	-	-	2	7
CO-2	3	3	2	-	2	-	-	-	-	-	2	12
CO-3	3	3	2	2	2	-	-	-	-	-	2	14
CO-4	3	3	2	-	2	-	-	-	-	-	2	12
CO-5	3	3	2	-	2	-	-	-	-	-	2	12
CO-6	3	2	2	-	-	2	-	-	-	-	2	11
Total	18	16	10	2	8	2	0	0	0	0	12	68

Subject Code:	1BCS304	TITLE: OPERATING SYSTEMS			Faculty Name:	Ms. Sandhya G
List of Course Outcomes	Program Specific Outcomes				Total	
	PSO-1	PSO-2	PSO-3			
	CO-1	3	-	-	3	
	CO-2	3	-	-	3	
	CO-3	3	-	-	3	
	CO-4	3	-	-	3	
	CO-5	3	-	-	3	
	CO-6	3	-	-	3	
	Total	18	-	-	18	

Note: 3 = Strong Contribution, 2 = Average Contribution, 1 = Weak Contribution, - = No Contribution

Course coordinator Signature

HoD Signature

