AMITY UNIVERSITY
UTTAR PRADESH

FORMAT FOR COURSE CURRICULUM

L	T	P/S	SW/FW	PSDA	TOTAL CREDIT UNITS
2 -	-	4	4	5	6

Course Title: Principles of Operating Systems
Credit Units: 06
Course Level: UG
Course Code: CSIT150

Course Objectives: The aim of this course is to

- Provide the basic knowledge of the concepts involved in designing and working of an operating system
- Understand how it acts as a resource manager of the system.
- Describe how CPU management takes place through multiprocessing and switching between various processes.
- Discuss various issues such as Memory conflicts and how these conflicts are resolved by an operating system.

Course Focuses on: Employability
Pre-requisites: Nil

Course Contents/Syllabus:

	Weightage (%)
Module I Introduction	**15%**
Descriptors/Topics Introduction Operating system and functions, Classification of Operating systems: Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multithreaded Systems, Operating System Structure, System Components, Operating System Services, Kernels, Monolithic and Microkernel Systems.	
Module II Process Management	**20%**
Descriptors/Topics Process Concept, Process States, Process Synchronization, Critical Section, Mutual Exclusion, Classical Synchronization Problems, Process Scheduling, Process States, Process Transitions, Scheduling Algorithms Interprocess Communication, Threads and their management, Security Issues.	
Module III CPU Scheduling	**15%**

Descriptors/Topics Scheduling Concepts, Techniques of Scheduling, Preemptive and Non-Preemptive Scheduling: First-Come-First-Serve, Shortest Request Next, Highest Response Ration Next, Round Robin, Least Complete Next, Shortest Time to Go, Long, Medium, Short Scheduling, Priority Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock	
Module IV Memory Management	**15%**
Descriptors/Topics Memory Partition; Memory Management Techniques: Paging, Segmentation, Virtual Memory, Demand Paging; Page Replacement algorithms: FIFO algorithm, Least Recently Used Algorithm, Optimal Algorithm	
Module V File and Device Management	**15%**
Descriptors/Topics Types of Files; File Access Methods; File Allocation Methods: Contiguous, Linked and Index Allocation; I/O Devices; Device Controllers; Device Drivers; Directory Structure: Single Level, Tree Structured, Acyclic Graph and General Graph Directory, File Protection	
Module VI Shell introduction and Shell Scripting:	**20%**
Descriptors/Topics What is shell and various type of shell, Various editors present in Linux, Different modes of operation in vi editor, What is shell script, Writing and executing the shell script, Shell variable (user defined and system variables) System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr , unique utilities), Pattern matching utility (grep), case study available Operating Systems.	

Course Learning Outcomes:

- Explain the objectives and functions of modern operating systems.
- Explain the logical structure of, and facilities provided by, a modern operating system.
- Analyze the tradeoffs inherent in operating system design.
- Categorize different ways of implementing virtual memory.
- Demonstrate practical experience of mechanisms for handling situations of deadlock among processes.
- Demonstrate Linux operating system and able to write shell programs.

Mapping of Graduate Attributes with Course Learning Outcomes (CLOs):

Bloom's Level > / Course Learning Outcomes / Graduate Attributes	**Remembering**	**Understanding**	**Applying**	**Analyzing**	**Evaluating**	**Creating**
	• **Describe the logical structure of, and facilities provided by, a modern operating system.**	• **Explain the objectives and functions of modern operating systems.**	• **Analyze the tradeoffs inherent in operating system design.**	• **Categorize different ways of implementing virtual memory**		• **Demonstrate practical experience of mechanisms for handling situations of deadlock among processes.** • **Demonstrate Linux operating system and able to write shell programs**
Discipline Knowledge & Expertise	✓	√	✓	√		√
Self-Directed and Active Learning	√		√	√		√
Research and Enquiry			✓	√		
Information & Communication Technology Skills	√		√	√		√
Critical Thinking & Problem-Solving Abilities			✓	✓		✓
Communication Skills						
Creativity, Innovation & Reflective Thinking			√	√		√
Analytical & Decision-Making Ability			√	√		√
Leadership & Teamwork						
Multicultural Understanding & Global Outlook						
Integrity and Ethics						
Social & Emotional Skills						
Employability, Enterprise & Entrepreneurship	✓	✓	✓	✓		✓
Lifelong Learning						
Environment & Sustainability						

Pedagogy for Course Delivery:

The class will be taught using theory and case-based method. In addition to assigning the case studies, the students will be given assignments that judge their understanding the concept modern operating systems. Students will be taught using technical aids like Projectors by way of PowerPoint presentations Experiments shall be performed in the laboratory related to course contents. Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures

List of Professional Skill Development Activities (PSDA):

Self-Work activities can be conducted by dividing the class into group of 3-4 students and same will be evaluated by board of faculty members along with the group report. Some of the suggested activities are:

PSDA 1	ACTIVITY
1	Activity on Producer and Consumer
2	Banker's Algorithm in the operating system
3	Case study on the operating system- Unix/OS/Linux
4	Loading the operating system
5	The case study can include comparative analysis about any concept of different operating systems or comparison between the different versions of same operating systems

Lab/ Practical details

Lab on Operating Systems Note: Following exercises can be performed using Linux or Unix

1. Usage of following commands: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands: cal, cat(append), cat(concatenate), mv, cp, man, date.
3. Usage of following commands: chmod, grep, tput (clear, highlight),bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify "cal" command to display calendars of the specified months.
6. Write a shell script to modify "cal" command to display calendars of the specified range of months.
7. Write a shell script to accept a login name. If not a valid login name display message – "Entered login name is invalid".
8. Write a shell script to display date in the mm/dd/yy format.
9. Write a shell script to display on the screen sorted output of "who" command along with the total number of users.
10. Write a shell script to display the multiplication table any number,
11. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
12. Write a shell script to check whether the file have all the permissions or not.
13. Write a shell script to give the result of the student. Take marks of the five subjects , student name, roll no , percentage and show a message whether a student gets division as per the following rules: 70% and above ---- distinction 60%-70% ------first division 40%-59% -----second division Less than 40% ----- fail
14. . Write a Shell Script using for loop, which displays the message "Welcome to the UNIX System"
15. Write a Shell Script to change the filename of all files in a directory from lower-case to upper-case.

16.What happens during the execution of the following three commands? What is the difference betweeen them?

1. `mv file /dev/null`
2. `cp file /dev/null`
3. `cat file >/dev/null`

17.Write commands that output the ten biggest and the ten smallest files in directory `/etc`

18. Create a file with name "-f" which contains a line with current date and time. Then delete this file

19. Write a shell script to find the word is Palindrome or not

20 write a shell script to find number is even or Odd

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)
66.66	33.34

Theory Assessment (L&T):

	Continuous Assessment/Internal Assessment (40%)							End Term Examination
Components (Drop down)	Class Test	Viva	Quiz	PSDA			Attendance	
Linkage of PSDA with Internal Assessment Component, if any				Home Assignment	Seminar	GD		
Weightage (%)	10	3	5	7	5	5	5	60%

Lab/ Practical/ Studio Assessment:

	Continuous Assessment/Internal Assessment (40 %)					End Term Examination (60 %)	
Components (Drop down	**Class Test (Practical)**	**Lab Record**	**Performance**	**Viva**	**Attendance**	**Practical**	**Viva**
Weightage (%)	10	10	10	5	5	40	20

Mapping Continuous Evaluation components/PSDA with CLOs

Bloom's Level >	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Course Learning Outcomes / Assessment type/PSDA	• **Describe the logical structure of, and facilities provided by, a modern operating system.**	• **Explain the objectives and functions of modern operating systems.**	• **Analyze the tradeoffs inherent in operating system design.**	**Categorize different ways of implementing virtual memory**		• **Demonstrate practical experience of mechanisms for handling situations of deadlock among processes.** **Demonstrate Linux operating system and able to write shell programs**
PSDA 1	√					
PSDA 2		√				
PSDA 3			√			
PSDA 4			√			
PSDA 5						√
Class Test	√	√	√	√		√
Performance	√	√	√	√		√
Seminar	√	√	√	√		√
Home Assignment	√	√	√	√		√
Lab Record				√		√
Viva Voce	√	√	√	√		√
Group Discussion	√	√	√	√		√
End Term Examination	√	√	√	√		√

Text and Reference Books:

- Silberschatz Galvin Gagne, Operating Systems Concepts, Wiley Publication, Tenth Edition, 2018.
- A S Tanenbaum, Modern Operating Systems, Prentice Hall of India New Delhi, Fourth Edition, 2016.

Suggested Readings:

1. Dhanjay Dhamdhere, "Operating Systems," Third Edition, McGraw-Hill, 2017
2. Sumitabh Das, "Your Unix/Linux: The Ultimate Guide," McGraw Hill, 2012.

3. Richard Blum and Christine Bresnahan, “Linux Command Line and Shell Scripting Bible,” Wiley, 2015

Any other Study Material:

NPTEL Lecture Series: https://nptel.ac.in/courses/106/108/106108101/