Lab Plan
Branch: Computer Engineering
Semester: 4 – Div A & B **Year: 2022-2023**

Course Title: Operating System (CSL403)	**Contact Hrs: 02Hrs/Week**
Duration of SEE: 2Hrs	
Lab Plan Author: Prachi Patil	**Date: 21-1-23**
Checked By: Dr. Sujata Deshmukh	**Date:27-1-23**

Prerequisites: Any programming language

Suggested List of Experiments		
Sr. No.		**Content**
1		**Explore Linux Commands**
	1.1	**Explore usage of basic Linux Commands and system calls for file, directory and process management.** For eg: (mkdir, chdir, cat, ls, chown, chmod, chgrp, ps etc. system calls: open, read, write, close, getpid, setpid, getuid, getgid, getegid, geteuid. sort, grep, awk, etc.)
2		**Linux shell script**
	2.1	Write shell scripts to do the following: a. Display OS version, release number, kernel version b. Display top 10 processes in descending order c. Display processes with highest memory usage. d. Display current logged in user and log name. e. Display current shell, home directory, operating system type, current path setting, current working directory.
3.		**Linux- API**
	3.1	Implement any one basic commands of linux like ls, cp, mv and others using kernel APIs.
4.		**Linux- Process**
	4.1	a. Create a child process in Linux using the fork system call. From the child process obtain the process ID of both child and parent by using getpid and

		getppid system call. b. Explore wait and waitpid before termination of process.
5		**Process Management: Scheduling**
	5.1	a. Write a program to demonstrate the concept of non-preemptive scheduling algorithms. b. Write a program to demonstrate the concept of preemptive scheduling algorithms
6		**Process Management: Synchronization**
	6.1	Write a C program to implement solution of Producer consumer problem through Semaphore
7		**Process Management: Deadlock**
	7.1	a. Write a program to demonstrate the concept of deadlock avoidance through Banker's Algorithm b. Write a program demonstrate the concept of Dining Philospher's Problem

8.		**Memory Management**
	8.1	a. Write a program to demonstrate the concept of MVT and MFT memory management techniques b. Write a program to demonstrate the concept of dynamic partitioning placement algorithms i.e. Best Fit, First Fit, Worst-Fit etc.
9		**Memory Management: Virtual Memory**
	9.1	a. Write a program to demonstrate the concept of demand paging for simulation of Virtual Memory implementation b. Write a program in C demonstrate the concept of page replacement policies for handling page faults eg: FIFO, LRU etc.
10		**File Management & I/O Management**
	10.1	a. Write a C program to simulate File allocation strategies typically sequential, indexed and linked files b. Write a C program to simulate file organization of multi-level directory structure. c. Write a program in C to do disk scheduling - FCFS, SCAN, C-SCAN

List of Experiments		
Sr.No.	**Title**	**Attained CO**
1	(a) Study Linux File System, Types of Users, Environment Variables (b) Study basic commands, User , File and Process related commands	**1**
2	To study basics of Shell Scripting and write scripts	**1**
3	To study Process and File Management System Calls	**1**
4	Implement various Process scheduling algorithm and evaluate their performance.	**2**
5	1.WAP to demonstrate how to use lock mechanism to achieve process synchronization. 2.WAP to demonstrate the use of Queue mechanism to achieve process synchronization in Producer – Consumer Problem.	**3**
6	Write a menu driven program. 1) Detect if a deadlock exists. Also show the processes involved in deadlock 2) Check if the deadlock can be avoided (using bankers algo.). If yes, give the safe state sequence.	**3**
7	Implement various page replacement policies and compare performances.	**5**
8	Implement Dynamic Partitioning Placement Algorithms	**4**
9	Implement Disk Management Algorithms	**6**
10	Analyze system performance using Simulator	1,2,3,4,5,6
Assignments		
11	Case Study: Real time applications wrt Operating System performance. (Research Paper Based Study)	1,2,3,4,5,6
12	Study of any OS	1,2,3,4,5,6

Course Outcomes (CO):
On successful completion of course learner will be able to:
CSL403.1: Demonstrate basic Operating system Commands, Shell scripts, System Calls and API wrt Linux
CSL403.2: Implement various process scheduling algorithms and evaluate their performance
CSL403.3: Implement and analyze concepts of synchronization and deadlocks.
CSL403.4: Implement various Memory Management techniques and evaluate their performance
CSL403.5: Implement and analyze concepts of virtual memory.
CSL403.6: Demonstrate and analyze concepts of file management and I/O management techniques

CO-PO Mapping: (BL – Blooms Taxonomy, C – Competency, PI – Performance Indicator)

CO	BL	C	PI	PO	Mapping
CSL403.1: Demonstrate basic Operating system Commands, Shell scripts, System Calls and API wrt Linux	1	1.3, 1.4	1.3.1, 1.4.1	1, 9, 10	2 ,3,3
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4		
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,		
CSL403.2: Implement various process scheduling algorithms and evaluate their performance	2	1.4	1.4.1	1,2, 9,10	1
		2.2. 2.3 2.4	2.2.4, 2.3.2, 2.4.1,		1
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4		3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,		3
CSL403.3: Implement and analyze concepts of synchronization and deadlocks.	2	1.4	1.4.1	1	1
		2.2	2.2.3	2	2
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4	9	3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,	10	3

CSL403.4: Implement various Memory Management techniques and evaluate their performance	2	1.4	1.4.1	1	1
		2.2 2.3 2.4	2.2.3, 2.2.4, 2.3.2, 2.4.1,	2	2
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4	9	3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,	10	3
CSL403.5: Implement and analyze concepts of virtual memory.	2	1.4	1.4.1	1	1
		2.2 2.3 2.4	2.2.3, 2.2.4, 2.3.2, 2.4.1,	2	2
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4	9	3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,	10	3
CSL403.6: Demonstrate and analyze concepts of file management and I/O management techniques	2	1.4	1.4.1	1	1
		2.2 2.3 2.4	2.2.3, 2.2.4, 2.3.2, 2.4.1,	2	2
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4	9	3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,	10	3

CO-PO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CSL403.1	2	-	-	-	-	-	-	-	3	3	-	-
CSL403.2	1	1	-	-	-	-	-	-	3	3	-	-

CSL403.3	1	2	-	-	-	-	-	-	3	3	-	-
CSL403.4	1	2	-	-	-	-	-	-	3	3	-	-
CSL403.5	1	2	-	-	-	-	-	-	3	3	-	-
CSL403.6	1	2	-	-	-	-	-	-	3	3	-	-

CO-PSO Mapping:

CO	PSO1	PSO2
CSL403.1	-	-
CSL403.2	-	-
CSL403.3	-	-
CSL403.4	-	-
CSL403.5	-	-
CSL403.6	-	-

CO Measurement Weightages for Tools:

Direct Tool				**Indirect tool**
Tools	**Lab**	**Assignment/Quiz**	**SEE**	**Course Exit Survey**
CSL403.1	20%	20%	60%	100%
CSL403.2				
CSL403.3				
CSL403.4				
CSL403.5				
CSL403.6				

Attainment:

CO CSL403.1:
Direct Method = 0.2*lab +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSL403.2:
Direct Method = 0.2*lab +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSL403.3:
Direct Method = 0.2*lab +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSL403.4:
Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSL403.5:
Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSL403.6:
Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

Textbooks:	
1	William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918.
2	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley &Sons, Inc., 9th Edition, 2016, ISBN 978-81-265-5427-0
References:	
1	Achyut Godbole and Atul Kahate, Operating Systems, McGraw Hill Education, 3rd Edition
2	Andrew Tannenbaum, Operating System Design and Implementation, Pearson, 3rd Edition.
3	Maurice J. Bach, "Design of UNIX Operating System", PHI
4	Sumitabha Das, "UNIX: Concepts and Applications",McGraw Hill, 4th Edition

Web References:

1. www.geeksforgeeks.com
2. www.javatpoint.com
3. For Slow Learners: Gate Smashers (Youtube Channel): https://www.youtube.com/watch?v=WJ-UaAaumNA
4. For Fast Learners: Swayam: https://onlinecourses.nptel.ac.in/noc20_cs04/preview
5. Stanford University: http://web.stanford.edu/~ouster/cgi-bin/cs140-spring14/lectures.php

Evaluation Scheme
Practical and Oral Exam: 25 Marks
Termwork: 25 Marks

Practical Session Plan

List of Experiments		
Sr.No.	**Title**	**Week Plan**
1	(a) Study Linux File System, Types of Users, Environment Variables (b) Study basic commands, User , File and Process related commands	4th Week Jan
2	To study basics of Shell Scripting and write scripts	1st Week Feb
3	To study Process and File Management System Calls	2nd Week Feb
4	Implement various Process scheduling algorithm and evaluate their performance.	3rd Week Feb
5	1.WAP to demonstrate how to use lock mechanism to achieve process synchronization.	4th Week Feb

	2.WAP to demonstrate the use of Queue mechanism to achieve process synchronization in Producer – Consumer Problem.	
6	Write a menu driven program. 1) Detect if a deadlock exists. Also show the processes involved in deadlock 2) Check if the deadlock can be avoided (using bankers algo.). If yes, give the safe state sequence.	1st Week March
7	Implement various page replacement policies and compare performances.	2nd Week March
8	Implement Dynamic Partitioning Placement Algorithms	3rd Week March
9	Implement Disk Management Algorithms	1st Week April
10	(New Experiment) Analyze system performance using Simulator	2nd Week April
Assignments		
11	Case Study: Real time applications wrt Operating System performance. (Research Paper Based Study) (for Fast learners)	March 1st Week
12	Study of any OS (for Slow Learners)	March 4th Week

Verified by:

Programme Coordinator	**Subject Expert**
Monika Khanore	Dr. Sujata Deshmukh