COURSE DESCRIPTION FORM: CL220: Operating System Lab

INSTITUTION FAST School of Computing, National University of Computer and Emerging Sciences, Islamabad Campus

Computer Science (BS): **Spring-2022**

PROGRAM TO BE EVALUATED

Course Description

Course Code	CL220
Course Title	Operating System Lab
Credit Hours	1
Lab Instructors	Madiha Umar, Maryam Shahbaz, Naveed Khursheed
Grading Policy	Absolute Grading
Policy about missed assessment items in the course	Retake of missed assessment items (other than sessional/ final exam) will not be held. Student who misses an assessment item (other than sessional / final exam) is awarded zero marks in that assessment item i.e., late submission will not be accepted. For missed sessional/ final exam, exam retake/ pre-take application along with necessary evidence are required to be submitted to the department secretary. The examination assessment and retake committee decide the exam retake/ pre-take cases.
Course Plagiarism Policy	Plagiarism in assignment/project/final exam will result in F grade in the course. Plagiarism in a lab task will result in zero marks in the whole lab tasks category.
Prerequisites by Course(s) or Topics	Data Structures
Assessment Instruments with Weights (Sessional exam, final exam, lab Project, lab tasks, etc.)	Assessment with the weight.

Assessment Type	**Weight**
Lab Tasks 12	35 (Worst 2 will be dropped)
Project	15
Assignment	10 (Worst 1 will be dropped)
Quiz	5
Final Exam	35

Course Coordinator	Madiha Umar
URL (if any)	
Course Catalog Description	Operating system is a course offered to BS CS. This course covers in detail many topics in Operating System design and implementation. Major topics to be covered are Process Management, Thread Management, Process Synchronization, Deadlock management, Memory Management and File Management etc. This is a programming intensive course

	and involves implementation and use of system calls, multithreaded applications, simulation of memory management, scheduling etc with emphasis on synchronization issues.
Laboratory Manual	Uploaded on Google Classroom
Course Goals	

A. Course Learning Outcomes (CLOs)

After course completion, the students shall be able to:

1. Describe, discuss, and analyze, services provided by the modern Operating Systems.
2. Understand, design, and implement solutions employing concepts of Processes and Threads.
3. Compare and contrast the commonly used for scheduling of tasks in operating systems and analyze different synchronization issues and implement synchronization mechanisms like Semaphores, Monitors, etc.
4. Understand and deploy OS concepts related to Virtualization.
5. Understand the operating system's resource management techniques, dead lock management techniques, memory management techniques.

B. Program Learning Outcomes (PLOs)

For each attribute below, indicate whether this attribute is covered in this course or not. Leave the cell blank if the enablement is little or non-existent.

1. Computing Knowledge:	Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems	✔
2. Problem Analysis:	Identify, formulate, research literature, and analyze complex computing problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences.	✔
3.Design/Develop Solutions:	Design solutions for complex computing problems and design systems, components, and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	✔
		✔

4. Investigation & Experimentation:	Conduct investigation of complex computing problems using research-based knowledge and research-based methods.	
5. Modern Tool Usage:	Create, select, and apply appropriate techniques, resources, and modern computing tools, including prediction and modelling for complex computing problems.	✔
6. Society Responsibility:	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to context of complex computing problems.	
7. Environment & Sustainability	Understand and evaluate sustainability and impact of professional computing work in the solution of complex computing problems.	
8. Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of computing practice.	
9.Individual and Teamwork:	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.	✔
10.Communication	Communicate effectively on complex computing activities with the computing community and with society at large	
11. Project Management and Finance	Demonstrate knowledge and understanding of management principles and economic decision making and apply these to one's own work as a member of a team.	
12. Lifelong Learning	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.	✔

C. Mapping of CLOs to PLOs	

(CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)

		PLOs											
		1	2	3	4	5	6	7	8	9	10	11	12
CLOs	1	✔	✔		✔								
	2	✔	✔	✔	✔								
	3	✔	✔		✔	✔				✔			
	4	✔	✔	✔	✔	✔				✔			
	5	✔	✔	✔	✔	✔				✔			✔
	6	✔	✔		✔								

Topics covered in the course
(Assume 15-week instruction and 3 contact hours per week)

1. Topics to be covered:

List of Topics	No. of Weeks	Contact Hours	CLO(s)
Process Creation – mainly fork(), wait(), exit() system calls	1	3	1
Exec() System call – a family of six functions	1	3	1
Inter-process communication	1	3	1
Named pipes	1	3	1
Dup System calls	1	3	1
Introduction to Threads	1	3	2
Multithreading	1	3	2
Thread Attributes	1	3	2
Mutex	1	3	1,2
Detailed Exercise on Mutex	1	3	1,2
Semaphores	1	3	1,2
Detailed Exercise on Semaphore	1	3	1,2
Project	1	3	2,3,5
Total	**15**	**39**	

Practical/ Programming Work/ Tools	Introduction of lab and shell scripting, introduce the concept of processes, process creation and handling, hands on practice of exec system call, communication techniques between processes, introduction to signal and signal handling, concept of threading, how modern operating systems utilizing threading for parallel processing, how to synchronize processes and threads. Evaluation is managed with problem approach evaluated by lab work, practical quizzes and lab project.			
Lab Time Spent (in percentage)	**Theory**	**Problem Analysis**	**Solution Design**	**Social and Ethical Issues**
	20	30	40	10