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School of Computing and Intelligent Systems

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Operating Systems Lab | CCE2231 | 1 Credit | 0 0 2 1

Session: Jan 25 - May 25 | Class: B. Tech. IV SEM

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A. Introduction: The objective of this lab is to provide students practical knowledge of Unix Commands, various scheduling page replacement and deadlock handling algorithms and to familiarize the studentswith the fundamental concepts, techniques and implementation details of operating systems. Participation in this course will enable students to compare the working behaviour and functions of different operating systems.

B. Course Outcomes: At the end of the course, students will be able to:

[CCE2231.1]: Explain basic Unix commands and write shell Scripts.
[CCE2231.2]: Build Skills to develop system programs using file and process system calls.
[CCE2231.3]: Compare algorithms used for process scheduling.
[CCE2231.4]: Describe concepts related to concurrency and achieve the same for cooperating processes, apply deadlock handling strategies to solve resource allocation problems.
[CCE2231.5]: Evaluate the performance of memory management techniques and page replacement algorithms.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

[PO.2]. Problem analysis: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

[PO.3]. Design/development of solutions: Upon analyzing, the graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

[PO.4]. Conduct investigations of complex problems: To imbibe the inquisitive practices to have thrust forinnovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

[PO.6]. The engineer and society: The engineers are called society builders and transformers. B. Tech IT graduate should be able to apply reasoning informed by the contextual knowledge to assess societal,

health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7]. Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to bepracticed in each action. Thus, a B Tech IT should understand the impact of the professional engineeringsolutions in societal and environmental contexts, and demonstrate the knowledge of, and need forsustainable development.

[PO.8]. Ethics: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

[PO.9]. Individual and teamwork: United we grow, divided we fall is a culture at MUJ. Thus, an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

[PO.12]. Life-long learning: Recognize the need for and have the preparation and ability to engage in independentand life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment	Continuous evaluation: Record- 20 Marks Execution- 20 Marks Viva- 20 Marks	60
End Term Exam	End Term Exam: Viva- 15 Marks Written Exam- 15 Marks Execution- 10 Marks	40
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leavesincluding medical leaves.	

E. SYLLABUS

Testing the use of UNIX commands; Working with VI editor; Shell: UNIX shell commands, System Administration: user management, security, file management; Inter-process communication: shared memory, message passing, pipes; UNIX system calls: system calls for process management, file management; Process synchronization: bounded buffer problem, Peterson's solution, semaphore; Building multi-threaded and multi-process applications: multithreading using pthread library; CPU scheduling algorithms; Deadlock: detection algorithms, deadlock avoidance algorithms; Page replacement algorithms; Memory allocation algorithms;

Disk scheduling algorithms.

TEXT BOOKS

1. S. Das, "Unix Concepts and Applications", 4th Edition, Tata McGraw-Hill, 2017.

2. A. Silberschatz, P. B. Galvin and G. Gagne, "Operating System Concepts", 9th Edition, Wiley, 2014.

REFERENCE BOOKS

1. R. Blum, and C. Bresnahan, "Linux Command Line and Shell Scripting Bible", 3rd Edition, Wiley, 2015.

2. Maurice J. Bach, "The Design of the UNIX Operating System", Pearson Education.

F. Lecture Plan

LabNo.	Topics	Session Outcome	Mode of Delivery		Corresponding CO
1-3	**Introduction- Linux Operating System, Unix Commandsand Shell Scripts**	Define basic terminology related to OS. List and demonstrate various basic Unix and shell script commands. Illustrate use of Unix and Shell scripts commands in writing shellscripts.	Lecture Demonstration at system	**CCE2231.1**	Continuous Evaluation End Term Examination
4	**System Calls**	Program writing using file system related system calls.	Lecture Demonstration at system	**CCE2231.2**	Continuous Evaluation End Term Examination
5-6	**Process Control**	Illustrate process creation and its termination. (Using fork and kill) Illustrate Inter-Process communication using pipes. Illustrate Zombie and Orphan Process.	Lecture Demonstration at system	**CCE2231.2**	Continuous Evaluation End Term Examination
7	**Thread**	Implementation of concept of Multi-Threading using PThread inLinux OS.	Lecture Demonstration at system	**CCE2231.2**	Continuous Evaluation End Term Examination
8	**Process Scheduling**	Apply knowledge of CPU scheduling algorithms in Implementing various CPU Scheduling Algorithms viz. FCFS, SJF, Priority and Round Robin.	Lecture Demonstration at system	**CCE2231.3**	Continuous Evaluation End Term Examination

9-10	**Process Synchronization**	Implementation of Reader-Writer, Producer-Consumer,Synchronization Problems using Semaphores	Lecture Demonstration at system	**CCE2231.4**	Continuous Evaluation End Term Examination
11	**Deadlock**	Apply Bankers Algorithm for Deadlock Avoidance.	Lecture Demonstration at system	**CCE2231.4**	Continuous Evaluation End Term Examination
12-13	**Memory ManagementPolicies**	Illustration of Page Replacement Algorithms: FIFO, Optimal and LRU Illustration of memory allocation strategies: First Fit, Best Fit,Next Fit and Worst Fit	Lecture Demonstration at system	**CCE2231.5**	Continuous Evaluation End Term Examination

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G. Course Articulation Matrix: (Mapping of COs with POs):

CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
[CCE2231.1]:	Explain basic Unix commands and write shell Scripts.	1	2	2	2	1				1		1		1	1	1
[CCE2231.2]:	Build skills to develop system programs using file and process system calls and P.Thread API.	1	2	1	1	1								1		
[CCE2231.3]:	Compare various algorithms used for process scheduling.	1	2	1	1	1								1		
[CCE2231.4]:	Describe concepts related to concurrency and achieve the same for cooperating processes, apply various deadlock handling strategies to solve resource allocation problems.	1	2	1	1	1				1		1		1	1	
[CCE2231.5]:	Evaluate the performance of different memory management techniques and page replacement algorithms.	1	1	2	1	1				1		1		1		

Dr. Ghanshyam Raghuwanshi	Mr. Vivek Sharma	Dr. Vaishali Yadav	Dr. Sunil Kumar
[Course Coordinator]	[Course Instructor]	[Course Instructor]	[Head of Department]