

CST - 301 (Operating Systems)

Second Semester

Course Description

Course Code Number	CST-301	Course Title	Operating Systems
Semester Hours	Total 4 hours per week Lecture 2 hours per week Lab 2 hours per week	No. of Credit Units	3
Prerequisite	None	Course Coordinator	Dr. Hnin Thant Lwin Faculty of Computer Science
Course Length	15 Weeks	Type of Instruction	Lecture + Lab

Course Outline

This course introduces the concepts, structure, and mechanisms of operating systems. The intent of this course is to provide students with an opportunity to learn and discuss certain fundamentals of the operating system design, which depends on the current state of technology. Topics included in this course are Operating System Overview, Process Description & Control, Threads, Memory Management, Uniprocessor Scheduling and File Management.

Course Objective

The objective of this course is to introduce basic concepts of Operating System, its functions and services, to analyze the processes, multithreading, symmetric multiprocessing (SMP) and microkernel, to understand the design areas that have been instrumental in the development of modern operating systems, to familiarize various views and management policies adopted by OS as pertaining with processes and file, to learn the mechanisms of OS to handle processes and threads and their communication and to understand the scheduling techniques that use in OS and access the performance of difference scheduling policies.

Learning Outcomes

On completion of the course the student will be able to:

- Understand the structure of OS and basic architectural components involved in OS
- Understand the operating system's objectives and functions, developments leading to modern operating systems, virtual machines, OS design considerations and modern operating systems
- Know the applications to run in parallel either using process or thread models of different OS
- Understand the memory management, memory partitioning, paging, segmentation and the concept of virtual memory
- Understand how to manage files, processes and threads
- Understand the various scheduling policies and evaluate their performance

Text Book

1. Operating Systems Internals and Design Principles (9th Edition) by William Stallings

Reference Books

1. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.
2. Operating System Concepts (7th edition) By Abraham Silberschatz, Peter Baer Galvin, Greg Gagne
3. Operating Systems Internals and Design Principles (7th Edition) by William Stallings

Reference for Lab

1. <https://rhlearn.gillmore.ca/>

Course Organization

Student participation in this course will involve the following activities:

1. Attending the lectures
2. Tutorial
3. Assignment
4. Practical
5. Moodle/Quiz
6. Exams

Assessment Plan for the Course

1. Paper Exam	50%
2. Class Participation	10%
3. Assignment	10%
4. Practical/ Test	20%
5. Moodle/Quiz	10%

Grading System

UCSY follows a letter grade system comprising of grades A, A-, B+, B, B-, C+, C, C-, D and F. All marks obtained by students during the semester will be used in the grading process. A grade of “C” or better is required in this course because it is a prerequisite for other courses in the program. **The student who gets the grade point less than 2 must sit Re-Exam.**

The grading scale for this course is:

Marks obtained	Letter Grade	Grade Point
≥ 90	A	4
85 – 89	A-	3.75
80 – 84	B+	3.25
75 – 79	B	3
70 – 74	B-	2.75
65 – 69	C+	2.25
60 – 64	C	2
55 – 59	C-	1.75
50 – 54	D	1
0 – 49	F	0

Fail Grade and Re-Exam: C-, D, F (Grade point <2)

Class Attendance and Participation Policy:

- **Attendance:**Class attendance is **mandatory**. Most of the material you will learn will be covered in the lectures, so it is important that you not miss any of them. You are expected to show up on time for class, and stay for the whole lecture. Students are expected to attend each class, to complete any required preparatory work (including assigned reading) and to participate actively in lectures, discussions and exercises.
- Mobile phones **must** be silenced and put away for the entire lecture unless use is specified by the instructor. You may not make or receive calls on your cell phone, or send or receive text messages during lectures.
- You are responsible for all material sent as email. Ignorance of such material is no excuse. You are responsible for all materials presented in the lectures.
- Your conduct in class should be conducive towards a positive learning environment for your class mates as well as yourself.
- **There are no extra credit opportunities.**

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Students may not do additional work nor resubmit any graded activity to raise a final grade.

- **Test**

Test will start after one or two chapters finished and the coordinator will announce the date for the test.

- **Exam**

The exam will be conducted on-campus, in a classroom. The dates/times/locations will be posted on Board as soon as possible.

For this course, the following additional requirements are specified:

All work submitted for a grade must have been prepared by the individual student. Students are expressly prohibited from sharing any work that has been or will be submitted for a grade, in progress or completed, for this course in any manner with a person other than the instructor and teaching assistant(s) assigned to this course). Specifically, students may not do the following, including but not limited to:

- Discuss questions, example problems, or example work with another person that leads to a similar solution to work submitted for a grade.
- Give to, show, or receive from another person (intentionally, or accidentally because the work was not protected) a partial, completed, or graded solution.
- Ask another person about the completion or correctness of an assignment.
- Post questions or a partial, completed, or graded solution electronically (e.g. a Web site).
- All work must be newly created by the individual student for this course. Any usage of work developed for another course, or for this course in a prior semester, is strictly prohibited without prior approval from the instructor.
- Posting or sharing course content (e.g. instructor provided lecture notes, assignment directions, assignment questions, or anything not created solely by the student), using any non-electronic or electronic medium (e.g. web site, FTP site, any location where it is accessible to someone other than the individual student, instructor and/or teaching assistant(s)) constitutes copyright infringement and is strictly prohibited without prior approval from the instructor.

Tentative Lecture Plan

No.	Topics	Week	Remark
	Operating System Overview		
1.	O/S objectives and functions - OS as a user / computer interface - OS as a resource manager The evolution of O/S	Week 1	Chapter 2

	<ul style="list-style-type: none"> - Serial Processing - Simple batch system - Multi-programmed batched system - Time Sharing system <p>Major Achievements</p> <ul style="list-style-type: none"> - Processes - Memory management 		
2.	<ul style="list-style-type: none"> - Information Protection & Security - Scheduling and Resource Management <p>Developments leading to Modern Operating Systems</p> <p>Review Chapter 2 (All review questions)</p>	Week 2	Chapter 2
	Process Description & Control		
3.	<p>What is A Process</p> <ul style="list-style-type: none"> - Processes and Process Control Block <p>Process States</p> <ul style="list-style-type: none"> - The Creation and Termination of Processes 	Week 2	Chapter 3
4.	<p>A Five States Model</p> <p>Suspended Processes</p> <p>The need for swapping</p> <p>Process Description</p> <p>Process Control</p>	Week 3	Chapter 3
5.	<p>Execution of the OS</p> <ul style="list-style-type: none"> - Non process kernel - Execution within user process - Process based O/S <p>Review Chapter 3 (All review questions)</p> <p>Tutorial</p>	Week 4	Chapter 3
	Threads		
6.	<p>Processes & Threads</p> <ul style="list-style-type: none"> - Multithreading - Threaded Functionality - Threaded states - Thread synchronization <p>Types of Threads</p> <ul style="list-style-type: none"> - User level threads - Kernel level threads - Combined Approaches 	Week 5	Chapter 4

	Review Chapter 4 (All review questions)		
	Memory Management		
7.	7.1 Memory management requirements 7.2 Memory Partitioning	Week 6	Chapter 7
8.	7.3 Paging 7.4 Segmentation	Week 7	Chapter 7
9 .	Problem 7.2, 7.6, 7.7, 7.12, 7.14 Review Chapter 7 (All review questions) Tutorial	Week 8	Chapter 7
	Uniprocessor Scheduling		
10.	Types of Scheduling -Long Term Scheduling -Medium Term Scheduling -Short Term Scheduling Scheduling Algorithms -Short term scheduling Criteria -The Use of Priorities -Alternative Scheduling Policies	Week 9	Chapter 9
11.	First Come First Served Round Robin Shortest Process Next Shortest Remaining Time Highest Response Ratio Next Feedback Problems 9.1, 9.2, 9.3, 9.4, 9.16 Review chapter 9(All Review Questions)	Week 10	Chapter 9
	I/O Management & Disk Scheduling		
12.	I/O Devices Organization of the I/O Function Operating System Design Issues I/O Buffering (Single buffer, Double Buffer, Circular Buffer) Disk Scheduling -Disk Performance parameters -Disk Scheduling policies	Week 11	Chapter 11
13.	Example of Disk Scheduling policies FIFO, SSTF, SCAN, C-SCAN RAID	Week 12+13	Chapter 11

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	RAID Level 0 RAID 0 for high data transfer capacity RAID 0 for high I/O request Rate RAID Level 1, RAID level 2, RAID Level 3 Performance, RAID Level 4, RAID level5 , RAID Level 6		
14.	Disk Cache, Design Consideration Problems 11.3 Review Chapter 11 (All review questions)	Week 13	Chapter 11
	File Management		
15.	Overview File Organization and Access B-Trees File Directories File Sharing	Week 14	Chapter 12
16.	Record Blocking Secondary Storage Management Review Chapter 12 (All review questions) Tutorial	Week 15	Chapter 12

Tentative Plan (For Lab)

No.	Topics	Week	Remark
1.	Accessing the Command Line Executing commands Using the Bash Shell Lab exercise	Week 1	Chapter 1
2.	Managing Files from the Command Line - The Linux File System Hierarchy - Locating Files by Name - Managing Files Using Command-Line Tools - Matching File Names Using Path Name Expansion Lab exercise Reading Documentation Using man Command	Week 2+3	Chapter 2 Chapter 3
3.	Creating, Viewing, and Editing Text Files	Week	Chapter 4

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	<ul style="list-style-type: none"> - Redirecting Output to a File or Program - Editing Text Files from the Shell Prompt - Editing Text Files with a Graphical Editor Lab exercise	4+5	
4.	Managing Local Linux Users and Groups <ul style="list-style-type: none"> - Users and Groups - Gaining Superuser Access - Managing Local User Accounts - Managing Local Group Accounts Lab exercise	Week 6+7	Chapter 5
5.	Managing User Passwords Lab Exercise Lab Test	Week 8+9	Chapter 5
6.	Controlling Access to Files with Linux File System <ul style="list-style-type: none"> - Linux File System Permissions - Managing File System Permissions from the Command Line Lab exercise	Week 10+11	Chapter 6
7.	-Managing Default Permissions and File Access Lab exercise	Week 12+13	Chapter 6
8.	Monitoring and Managing Linux Process <ul style="list-style-type: none"> - Processes - Controlling Jobs - Killing Processes -Monitoring Process Activity Lab exercise Lab Test	Week 14+15	Chapter 7