

## **CST - 301 (Operating Systems)**

### **Second Semester**

### **Course Description**

<b>Course Code Number</b>	<b>CST-301</b>	<b>Course Title</b>	<b>Operating Systems</b>
<b>Semester Hours</b>	Total 4 hours per week Lecture 2 hours per week Lab 2 hours per week	<b>No. of Credit Units</b>	3
<b>Prerequisite</b>	<b>None</b>	<b>Course Coordinator</b>	Dr. Hnin Thant Lwin Faculty of Computer Science
<b>Course Length</b>	15 Weeks	<b>Type of Instruction</b>	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 (9<sup>th</sup> 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 (7<sup>th</sup> 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**

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

**Tentative Lecture Plan (30 Periods for 15 weeks)**

No.	Topics	Week	Remark
	<b>Operating System Overview</b>		
1.	O/S objectives and functions - OS as a user / computer interface - OS as a resource manager The evolution of O/S - Serial Processing - Simple batch system - Multi-programmed batched system - Time Sharing system Major Achievements -Processes -Memory management	Week 1	<b>Chapter 2</b>
2.	-Information Protection & Security - Scheduling and Resource Management Developments leading to Modern Operating Systems Review Chapter 2 (All review questions)	Week 2	<b>Chapter 2</b>
	<b>Process Description &amp; Control</b>		
3.	What is A Process -Processes and Process Control Block Process States -The Creation and Termination of Processes	Week 2	<b>Chapter 3</b>
4.	A Five States Model Suspended Processes The need for swapping Process Description Process Control	Week 3	<b>Chapter 3</b>
5.	Execution of the OS -Non process kernel -Execution within user process -Process based O/S Review Chapter 3 (All review questions) Tutorial	Week 4	<b>Chapter 3</b>
	<b>Threads</b>		
6.	Processes & Threads	Week 5	<b>Chapter 4</b>

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B.C.Sc. / B.C.Tech. (Third Year)

	<ul style="list-style-type: none"> <li>-Multithreading</li> <li>-Threaded Functionality</li> <li>-Threaded states</li> <li>-Thread synchronization</li> </ul> <p>Types of Threads</p> <ul style="list-style-type: none"> <li>- User level threads</li> <li>- Kernel level threads</li> <li>- Combined Approaches</li> </ul> <p>Review Chapter 4 (All review questions)</p>		
	<b>Memory Management</b>		
7.	7.1 Memory management requirements 7.2 Memory Partitioning	Week 6	<b>Chapter 7</b>
8.	7.3 Paging 7.4 Segmentation	Week 7	<b>Chapter 7</b>
9 .	Problem 7.2, 7.6, 7.7, 7.12, 7.14 Review Chapter 7 (All review questions) Tutorial	Week 8	<b>Chapter 7</b>
	<b>Uniprocessor Scheduling</b>		
10.	Types of Scheduling <ul style="list-style-type: none"> <li>-Long Term Scheduling</li> <li>-Medium Term Scheduling</li> <li>-Short Term Scheduling</li> </ul> <p>Scheduling Algorithms</p> <ul style="list-style-type: none"> <li>-Short term scheduling Criteria</li> <li>-The Use of Priorities</li> <li>-Alternative Scheduling Policies</li> </ul>	Week 9	<b>Chapter 9</b>
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	<b>Chapter 9</b>
	<b>I/O Management &amp; Disk Scheduling</b>		
12.	I/O Devices Organization of the I/O Function Operating System Design Issues	Week 11	<b>Chapter 11</b>

University of Computer Studies, Yangon  
B.C.Sc. / B.C.Tech. (Third Year)

	I/O Buffering (Single buffer, Double Buffer, Circular Buffer) Disk Scheduling -Disk Performance parameters -Disk Scheduling policies		
13.	Example of Disk Scheduling policies FIFO, SSTF, SCAN, C-SCAN RAID 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	Week 12+13	<b>Chapter 11</b>
14.	Disk Cache, Design Consideration Problems 11.3 Review Chapter 11 (All review questions)	Week 13	<b>Chapter 11</b>
	<b>File Management</b>		
15.	Overview File Organization and Access B-Trees File Directories File Sharing	Week 14	<b>Chapter 12</b>
16.	Record Blocking Secondary Storage Management Review Chapter 12 (All review questions) Tutorial	Week 15	<b>Chapter 12</b>

**Tentative Plan for Lab (30 Periods for 15 weeks)**

No.	Topics	Week	Remark
1.	Accessing the Command Line Executing commands Using the Bash Shell Lab exercise	Week 1	Chapter 1

