Department of Software Engineering (SE)
Faculty of Science and Information Technology (FSIT)
Daffodil International University (DIU)
(Version 1.0)

Course Code: SE 232/0613-232	**CIE Marks: 60**
Course Title: Operating System and System Program	**SEE Marks: 40**
Credits: 3	

Course Content (from Syllabus):
This course introduces about the modern operating systems. It focuses on UNIX-based operating systems, though alternative operating systems, including Windows are introduced. This course is beginning with an overview of the structure of modern operating systems. Over the course of the subsequent units, discuss the history of modern computers, analyze in detail each of the major components of an operating system (from processes to threads), and explore more advanced topics in the field, including concurrency (synchronization, mutual exclusion, deadlock, starvation), memory (both primary and secondary) management and input/output file management and organization.

Course Description/Rationale:

The course will start with a brief historical perspective of the evolution of operating systems over the years and will provide an introduction to operating system design and implementation. It will cover the major components of most operating system. This discussion will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, algorithms, synchronization, and deadlock), memory management (segmentation, paging, swapping), file systems, and operating system support for distributed systems.

Course Objective

To provide a solid conceptual understanding of the modern operating system. More specifically,

1. To explore the processes and threads roles, states, components, scheduling, concurrency of the modern operating system.

2. To demonstrate process scheduler.

3. To explain and analyze the concurrency problem including synchronization, mutual exclusion, deadlock and starvation.

4. To explain and solve problems on memory management (primary and secondary) and virtual memory management system and file management system.

Course Learning Outcome (CLO): (at the end of the course, students will be able to do :)

CLO1	**Interpret** the concept and design of processes, threads and their scheduling on modern operating system.
CLO2	**Demonstrate** the concept and solve the concurrency problem using process synchronization, mutual exclusion, and deadlock and starvation problem.
CLO3	**Implement** the memory management (primary, virtual and secondary).
CLO4	**Construct** the file management system of modern operating system.

Content of the course:

SL	Course Content (as summary)	Hrs.	CLO's
1	Overview of the concept and design of processes, threads and their scheduling on modern operating system.	12	CLO-1, CLO-2
2	Concurrency problem using process synchronization, mutual exclusion, the deadlock and starvation problem.	18	CLO-1, CLO-2, CLO-3
3	Memory management (primary, virtual and secondary)	12	CLO-3,
4	File Management System.	6	CLO-4

Mapping of Course Learning Outcomes to Program Learning Outcomes.

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
CLO-1	✓											
CLO-2		✓										
CLO-3			✓									

CLO-4									✓		

Mapping Course Learning Outcome (CLOs) with the Teaching-Learning and Assessment Strategy:

CLO's	Teaching Learning Strategy [course teacher will decide based on the type of the contents]	Assessment Strategy	Corresponding PLO number	Domain Level/ Learning Taxonomy
CLO-1	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion	Class Test/Assignment/ Midterm examination /Presentation	PLO-1	L2
CLO-2	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion	Class Test/Assignment/ Midterm examination/ Final examination/ Presentation	PLO-2	L3
CLO-3	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion	Class Test / Assignment/Midterm examination/ Final examination/ Presentation	PLO-3	L3, L4,L6
CLO-4	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion	Class Test/Assignment/ Final examination/ Presentation	PLO-10	L5, L6

Course Delivery Plan/Lesson Delivery Plan:

Week/ Lesson (hour)	Discussion Topic and Book Reference	Student Activities during Online and Onsite [course teacher will decide based on the type of the contents]	Mapping with CLO and PLO	Assessment Plan
Week-1 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Operating System Overview Operating System	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open	**CLO-1, CLO-2,**	

	Objectives and Functions The Evolution of Operating Systems Characteristics of Modern Operating Systems	discussion.	**PLO-1**	Class Test, Midterm
	Lesson 2: Windows Vista Overview Traditional UNIX Systems Modern UNIX Systems Linux	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-2 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Process Description and Control What is a Process? Process States	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		Class Test, Midterm
	Lesson 2: Process Description Process Control UNIX FreeBSD Process Management	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-3 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Threads, SMP, and Microkernels Processes and Threads Symmetric Multiprocessing (SMP)	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		Class Test, Midterm
	Lesson 2: Microkernels Windows Vista Thread and SMP Management Linux Process and Thread Management	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		

Week-4 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Uniprocessor Scheduling • Scheduling Algorithms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		Class Test, Assignment, Midterm
	Lesson 2: Types of Scheduling	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-5 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Scheduling Algorithms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		Class Test, Assignment, Midterm
	Lesson 2: Scheduling Algorithms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-6 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Scheduling Algorithms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	**CLO-2, PLO-2**	Class Test, Assignment, Midterm, Final Exam
	Lesson 2: Scheduling Algorithms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-7 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Scheduling Algorithms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		Class Test, Assignment, Midterm, Final Exam

Week	Lesson	Method	CLO/PLO	Assessment
	Lesson 2: Scheduling Algorithms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-8 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Scheduling Algorithms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
	Lesson 2: Scheduling Algorithms Traditional UNIX Scheduling [Textbook: Chapter-4]	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		Class Test, Assignment, Midterm, Final Exam
Week-9 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Concurrency: Mutual Exclusion and Synchronization • Semaphores • Monitors • Message Passing • Readers/Writers Problem	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	**CLO-3, PLO-3**	
	Lesson 2: • Principles of Concurrency • Mutual Exclusion: Hardware Support	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-10 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Semaphores Monitors	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	- - -	None

Week	Lesson	Teaching Strategy	CLO/PLO	Assessment
	Lesson 2: Message Passing Readers/Writers Problem	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-11 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Concurrency: Deadlock and Starvation Principles of Deadlock	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		Class Test, Assignment, Final Exam
	Lesson 2: Deadlock Prevention Deadlock Avoidance	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-12 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Deadlock Detection An Integrated Deadlock Strategy	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	**CLO-3, PLO-3**	Class Test, Assignment, Final Exam
	Lesson 2: Dining Philosophers Problem UNIX Concurrency Mechanisms Linux Kernel Concurrency Mechanisms	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-13 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Memory Management Memory Management Requirements	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		Class Test, Assignment, Final Exam
	Lesson 2: Memory Partitioning	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture		

		Paging Segmentation	video, Lecture note, Open discussion.		
Week-14 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Virtual Memory Hardware and Control Structures	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	**CLO-2, 3** **PLO- 2, 3**	
	Lesson 2: Operating System Software Linux Memory Management	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-15 Lesson 1 & 2 [3 Hours]	**Lesson 1:** I/O Management and Disk Scheduling I/O Devices Organization of the I/O Function	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	**CLO-4,** **PLO-10**	Class Test, Assignment, Final Exam
	Lesson 2: Operating System Design Issues I/O Buffering Disk Scheduling RAID Linux I/O	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.		
Week-16 Lesson 1 & 2 [3 Hours]	**Lesson 1:** File Management Overview File Organization and Access File Directories	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	**CLO-4,** **PLO-10**	Class Test, Assignment, Final Exam
	Lesson 2: File Sharing	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture		

	Record Blocking	video, Lecture note, Open discussion.		
	Secondary Storage Management			
	Linux File Management			

Assessment Pattern:

Assessment Task	CO'S				Mark (Total=100)
	CO1	CO2	CO3	CO4	
Attendance	--	--	--	--	7
Class Test (CT1, CT2, CT3)	--	--	--	--	15
Assignment	--	--	--	--	5
Presentation	--	--	--	--	8
Midterm Examination	11	9	5	0	25
Semester Final Examination	0	10	23	7	40
Total Mark	11	19	28	7	100

CIE – Breakup (Theory) [60 marks]

Bloom's Criteria	Attendance (07)	Class Test (15)	Assignment (05)	Presentation (08)	Mid Exam (25)
Remember					
Understand		05	02		05
Apply		05		02	05
Analyze		03	03	03	05
Evaluate		02			10

Create				03	

SEE – Semester End Examination [40 marks] {Theory}

Bloom Criteria	Score for the Test
Remember	
Understand	05
Apply	15
Analyze	15
Evaluate	05
Create	

Learning Materials:

Textbook/Recommended Readings:

"**Operating Systems: Internals and Design Principles**" William Stallings

8th Edition, Prentice Hall, 2015

Reference Books/Supplementary Readings:

1. Silberschatz, Galvin, Gagne: **Operating System Concepts**, 8th Edition, Wiley, 2008

2. Andrew S. Tanenbaum, Albert S. Woodhull: **Operating Systems, Design and Implementation**, 3rd Edition, Prentice Hall, 2006.

Other resources

1. **https://www.cs.drexel.edu/~jjohnson/2012-13/fall/cs543/#resources**
2. **https://www.mygreatlearning.com/academy/learn-for-free/courses/operating-system**
3. **https://www.tutorialspoint.com/operating_system/index.htm**