Course Outline
CSE-325: Operating Systems
Department of CSE, East West University

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Section	: 1
Credit Title	: Operating Systems
Credit Hour	: Theory (3) + Lab (1) = 4
Theory Class	: MW 10:10 - 11:40
Theory Class Room	: 110
Lab Class	: S 16:50 - 18:50
Lab Class Room	: 530
Instructor	: Md. Shamsujjoha (MSJ)
Office	: 5th Floor, Room 644
Office Hours	: SMTWR: 8.58-to-10.10, STR: 11.50-to-13.20, R: 15.10-to-16.40
E-mail	: dishacse@yahoo.com and msj@ewubd.edu

Course Objective and Outcomes: This course has two components: a *theory component* to teach you the concepts and principles that underlie modern operating systems, and a *practice component* (i.e. Lab) to relate theoretical principles with operating system implementation. In the theory component, you will learn about processes and processor management, concurrency and synchronization, memory management schemes, file system and secondary storage management, security and protection, etc. The practice component will complement the theory component through programming assignments illustrating the use and implementation of these concepts. At the end of the course you should:

❖ Understand fundamental operating system abstractions such as *processes*, *threads*, *files*, *semaphores*, *IPC abstractions*, *shared memory regions*, etc.,

❖ Understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions,

❖ Understand how the operating system abstractions can be implemented,

❖ Understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software,

❖ Understand basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented. These also include issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection (not strictly in the listed order)

Corse Content:

Mid-1 Exam:

❖ Overview of operating systems, functionalities and characteristics of OS. Hardware concepts related to OS, CPU states, I/O channels, memory hierarchy, and microprogramming. The concept of a process, operations on processes, process states, concurrent processes, process control block, process context. UNIX process control and management, PCB, signals, forks and pipes. Interrupt processing, operating system organization, OS kernel FLIH, dispatcher. Job and processor scheduling, scheduling algorithms, process hierarchies.

Mid-2 Exam:

❖ Problems of concurrent processes, critical sections, mutual exclusion, synchronization, deadlock. Mutual exclusion, process co-operation, producer and consumer processes. Semaphores: definition, init, wait, signal operations. Use of semaphores to implement mutex, process synchronization etc., implementation of semaphores. Critical regions, Conditional Critical Regions, Monitors, Ada Tasks. Interprocess Communication (IPC), Message Passing, Direct and Indirect Deadlock: prevention, detection, avoidance, banker's algorithm.

Final Exam:

❖ Memory organization and management, storage allocation. Virtual memory concepts, paging and segmentation, address mapping. Virtual storage management, page replacement strategies. File organisation: blocking and buffering, file descriptor, directory structure. File and Directory structures, blocks and fragments, directory tree, inodes, file descriptors, UNIX file structure. (The exact syllabus for the course will depend on how quickly we can cover the introductory chapters. Our aim for this semester is to cover chapters 1 through 14 of text book, and parts of chapter 18. Any exclusion will be announced in class.)

Text Book:

❖ **Operating System concepts (9th Ed.)**, - Abraham Silberschatz, Peter Baer galvin, Greg Gagne, John Wiley & Sons, Inc.

Reference Materials:

❖ **Operating System: Principal and Practice (1st Ed. V-0.03)**, - T. Anderson and M. Dahlin.
❖ **Modern Operating Systems (4th Ed.)** – Andrew S. Tanenbaum

Lab Environment (any one):

❖ **Unix Kernel**
❖ Programming Language C/C++

Course Website:

❖ http://groups.yahoo.com/group/cse_msj
  o CSE-325

Exam Dates:

❖ 1st Midterm Exam   : 11th February 2015 (Wednesday).
❖ 2nd Midterm Exam   : 11th March 2015 (Wednesday).
❖ Final Exam   : 15th April 2015 (Wednesday).

Mark Distribution:
- ❖ Class Participation   10%
- ❖ Quiz   10%
- ❖ Paper   10%
- ❖ 1st Mid Term Exam   15%
- ❖ 2nd Mid Term Exam   15%
- ❖ Final Exam   20%
- ❖ Labs   20%

Background:
- ❖ The official pre-requisites for this course is CSE 302 (245), however it makes two more un-official pre-requisite *i.e.*, Structured Programming and Data Structures. Much of the material covered in these three courses is directly relevant for this course, and therefore it is critical that you understand and remember the knowledge that you acquired in these courses. Some of the critical concepts that you should know well to do well in this course include: The hardware structure of modern computers, the role of the different parts (CPU, main memory, secondary memory, system bus, peripheral devices), the inter-connections between the different parts, and how the different parts interact to support computation, communication, and storage. The binary number system, basic arithmetic and logical operations on binary numbers, and converting binary numbers to decimal and vice-versa. The hardware-software interface including assembly language programming, accessing registers and main memory from software, I/O instructions, interrupts and interrupt handling, etc. Common data structures such as queues, stacks, lists, prioritized lists, etc. Implementation of such data structures using arrays, dynamic arrays, and linked-lists. Evaluation of algorithmic complexity of the operations.

Special Instructions:
- ❖ Class Lectures and Lab works are believed to be the most effective and reliable source of knowledge for this course. Therefore, students are strongly encouraged to participate in all the classes attentively. Students will not be allowed to enter into the classroom after 20 minutes of the starting time. If you miss more than two consecutive classes you will loose 10% from the class participation marks. Moreover, **You MUST have at least 80% class attendance to sit for the final exam**.

- ❖ There is zero tolerance for cheating at EWU. Students caught with cheat sheets in their possession, whether used or not used, &/or copying from cheat sheets, writing on the palm of hand, back of calculators, chairs or nearby walls and copying of codes, assignments would be treated as cheating in the exam hall and/or labs. The only penalty for cheating in exam hall is expulsion from EWU. For plagiarism, the grade will be automatically become zero for that lab or assignment.

- ❖ There will be **NO make-up examinations for Quiz & Lab Exam in any case**. Make up exam can only be considered for the midterms in case of emergency, you MUST either inform me or the department Chair within 24 hours of the exam time. Failure to do so will mean that you are trying to take UNFAIR advantage and you will be automatically disqualified.