BIRZEIT UNIVERSITY

College of Engineering and Technology

Electrical and Computer Engineering Department

Course: **ENCS3390 Operating Systems** First Semester, 2021-2022

,Instructors: Dr.Ayman Hroub :Office Number 5Masri115

Dr. Ahmad Afaneh Masri222

Textbook: A. Silberschatz, P. Galvin and G. Gagne. *Operating System Concepts*, John Wiley & Sons, Inc. 10th Edition (2018). 9th edition is OK.

Book Website/Slides: http://codex.cs.yale.edu/avi/os-book/OS9/slide-dir/

http://higheredbcs.wiley.com/legacy/college/silberschatz/1119320917/slide/allfiles.zip

Prerequisites: Computer Programming and Computer Organization/Microprocessors.

Course Objectives:

In this course we introduce the basic concepts of Operating Systems (OS): the interface between computer hardware and users/applications. We consider memory, processor, I/O device and information management issues and emphasize modern trends in OS design. Different approaches to OS design and implementation will be discussed and compared, and sample operating systems will be analyzed. We study some of the fine points of popular operating systems: Unix/Linux, Windows and iOS, Android and newer trends: Cloud OS. Assignments will include programming a portion of a toy OS. By the end of the course the student is expected to understand the basic features of modern operating systems and to be able to evaluate OS and make choices to fit his/her particular needs.

Course ABET Student Outcomes:

- (a) Ability to apply mathematics, science and engineering principles.
- (c) Ability to design a system, component, or process to meet desired needs.
- (e) Ability to identify, formulate and solve engineering problems.

Course Outline:

1. Introduction: Basic computer concepts. Definition and history of operating systems. The role and basic functions of an OS in a computer system.
2. Basic Operating systems concepts and operating system structure. Mono-programming and multiprogramming.
3. Processor Management: Jobs and Processes. Job and Process scheduling, Process synchronization and Inter-process communications, Interrupt handling. Races, Deadlocks and deadlock-race handling algorithms. Multiprocessor systems. Trends in processor management.
4. Memory Management: Single contiguous allocation of memory. Partitioned memory allocation: static and dynamic partitioning. Swapping. Overlays. Virtual memory: paging and segmentation. Memory hierarchies. Trends in memory management.
5. Midterm exam.
6. Input and Output (device) management: Device characteristics: dedicated, shared and virtual devices. SPOOLing. Trends in device management.
7. File (Information) management: File system design. Directory structures. Trends in information management.
8. Information Security and protection.
9. Tradeoffs in operating system design and implementation.
10. Case studies of selected commercial operating systems with emphasis on UNIX, small device (Palm) OS, among others.
11. Final exam.

Grading:

The grading is based on a midterm exam, a final exam and a series of assignments (including programming assignments) done by each student or in teams plus a number of quizzes, announced and unannounced. In-time submission of assignments is required for full credit. Late submissions will have partial or no credit. The major assignments of the course will be based on **programming** a portion of a toy operating system. The final product of this project is a *running* computer program. The programming language is to be chosen by the student. It is recommended (but not required) to use a high level programming language (e.g. Java, C, C++...). Students are encouraged (may be required) to use threading in the implementations. Much of the communications (including homework submission) will be done electronically through Ritaj. So each student is expected to have access to the email and the internet. You can expect live discussions for major assignments.

Here is the distribution of the course grade:

Midterm Exam:	30%
Final Exam:	40%
Class work: Projects, Assignments and Participation, Quizzes:	30%

Admin Matters/Ethics:

1- Assignments are Due at 23:59 (11:59PM) on the due date for electronic submissions and class meeting for hard copies. Late submission is penalized. Material is submitted online as a reply to ritaj messages.
2- When you submit attachment files please make sure that the file name has no "#" sign as such files are not handled properly by current Ritaj version.
3- Attendance is obligatory. Students may be penalized for missing classes. Usually I register attendance for each class.
4- University regulations allow the instructor to delete (withdraw) students who miss more than **6**

hours of classes of a given course (2 weeks worth of classes). So attendance is essential and will be monitored. A major plus is to attend and participate: ask questions and don't leave class with unclear points. If need be come to the office hours.

5- Students are expected to be in class in time (and certainly before the instructor starts the lecture).

6- Cell phones must be switched off (or silent) during the lecture. Please make sure you do that EVERY time you come to the lecture.

7- The office hours are there to HELP you if there is something you don't understand, or for something ACADEMIC you want to discuss. Please try to use them as much as you can. In case the displayed times are not suitable please make an appointment (say via a Ritaj memo).

Honor Code:

Students are expected to abide by Birzeit University honor code on all aspects of their academic work. Please review that on Ritaj. Additionally, students are expected to follow the code of conduct for the course appended to this course outline.

References:

1. Fox, R. Linux with Operating Systems Concepts. Chapman and Hall. 2014
2. Phillip A. Laplante and Seppo J. Ovaska. *Real-Time Systems Design and Analysis: Tools for the Practitioner*. Wiley. Nov 22, 2011.
3. Levin, J. Android Internals, J.Levin Publishing. 2015
4. Madnick S. and Donovan, J. *Operating Systems*; McGraw Hill Book Co. 1974.
5. Milonkevic, M. *Operating Systems: Concepts and Design*}; McGraw Hill Book Co. 1987.
6. Stalling, W. *Operating Systems*; Macmillan Publishing Co. 8th edition. 2014.
7. Rahi, R. *CLOUD OS: MICROSOFT'S MODERN PLATFORM FOR RUNNING WORLD'S APPS AND DATA.* June 2013.
8. Tanenbaum, A. *Modern Operating Systems*; 4th Ed. Prentice Hall Inc. 2014.
9. Andrew S Tanenbaum and Albert S Woodhull *Operating Systems Design and Implementation (3rd Edition) (Prentice Hall Software Series)* **2006**
10. Wang, P. *Mastering UNIX*; Chapman and Hall. 2010
11. White, T. *Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale* 4th Edition. O'Reilly Media; 2015.
12. Microsoft Windows Vista Home Basic 64-bit for System Builders [DVD] by Microsoft **(**DVD-ROM - Jan 30, 2007**) (**Windows Vista**)**

Good Luck