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Computer Science Department
cs.salemstate.edu

SYLLABUS **Fall 2009**

CSC 280 Operating System Principles **3.0 credits**
Prerequisite(s): CSC 260

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Section	Time	Room	Final Exam
01	TR 3:30-4:45	MH 206	**Dec 17, Thursday, 11:00am—1:00pm, MH 206**

Catalog description:
This course presents the evolution of computer operating systems, operating system functionalities, and current design and implementation techniques. Relationships between the operating system, computer architecture, and the user community are discussed. Three lecture hours per week.

Course Goals:
The aims of this course are:
- CG1: to present a descriptive overview of modern operating systems, their purposes and design principles;
- CG2: to discuss the most important ingredients, techniques, and algorithms used in their construction.

Course Objectives:
Upon completion of this course, the student will have demonstrated the ability to:
- CO1: summarize the development of operating systems from single-user and batch processing mainframes to modern multitasking systems;
- CO2: describe the mechanisms of interrupts and Direct Memory Access;
- CO3: describe how a process or task is represented in a modern computer system;
- CO4: differentiate between the concepts of process and thread and describe the behavior of a multithreaded system;
- CO5: describe the system components, actions, and algorithms involved in scheduling and managing concurrent processes;
- CO6: describe the concept of deadlock and the common techniques for recognizing, predicting, avoiding, and recovering from it;
- CO7: describe the common techniques and problems involved in memory management, including paging and virtual memory;
- CO8: describe the common techniques and problems involved in management of disk storage;
- CO9: describe the common techniques and problems involved in file management.

Course Topics:
The department-standard list of topics and a general course bibliography can be found on the Computer Science Department website (at http://cs.salemstate.edu/dept/index.php?page=184). The topics include:
- introduction:
  - What is an operating system?
  - functions and goals of an operating system
  - principal components
- review of relevant topics in computer hardware, architecture and organization
- evolution of operating systems
  - resident monitors (single-user systems)
  - multiprogramming
  - time-sharing

    - networks and distributed processing
    - multiprocessing
- operating system structures
    - system services, system calls
    - interrupts and interrupt handling
    - kernel of an operating system
    - layered structure
    - virtual machines
- evaluation of system performance
- protection and security mechanisms
- process management
    - the process concept
    - representation of processes
    - concurrent processes
    - CPU scheduling and scheduling algorithms
    - multiprocessor scheduling
- process coordination
    - classical synchronization problems
        - Critical Section Problem, Bounded Buffer Problem, Readers & Writers Problem, etc.
    - synchronization mechanisms
        - hardware
        - semaphores
        - language constructs
    - interprocess communication, message systems
- deadlocks
    - characterization, detection, prevention, avoidance, recovery
- storage management
    - memory management
    - swapping
    - paging
    - segmentation
    - virtual memory
        - demand paging
        - page replacement algorithms
        - frame allocation algorithms
        - thrashing
    - secondary storage management
        - disk structure
        - allocation methods
        - scheduling algorithms
- file management
    - file systems
    - access methods
    - file protection
- distributed systems
    - network topologies and types
    - coordination and deadlock in distributed systems
    - distributed file systems

The focus of the course is on a general discussion of the nature and functionality of operating systems. There is no extended treatment of specific case studies, although examples drawn from specific systems are used to illustrate major concepts. In addition to the above topics, we may also briefly introduce the following special purpose systems:

- real-time systems:
    - real-time system characteristics
    - features of real-time kernels

- multimedia systems:
    - What is multimedia?
    - requirements of multimedia kernels

Text(s): (required) **Operating System Concepts**, 8th Edition, by Silberschatz, Galvin, and Gagne. John Wiley & Sons. Inc.,2008. (ISBN: 0470128720, ISBN-13: 978-0-470-12872-5)

Additional references:

- *Operating System Concepts with Java* (7th edition, 2006), by Silberschatz, Galvin, and Gagne. Wiley.
- *Operating Systems: Internals and design Principles* (6th edition, 2008) (GOAL Series), by William Stallings. Prentice Hall.
- *Modern Operating Systems* (3rd edition, 2007), by Andrew S. Tanenbaum. Prentice Hall
- *Understanding Unix/Linux Programming: A Guide to Theory and Practice* (2003), by Bruce Molay. Prentice Hall.
- *Java: How to Program*, 7th edition. Deitel & Deitel. Prentice Hall, 2007.
- Simulators for Computer Science website at: http://vip.cs.utsa.edu/simulators/
- VMWare website: http://www.vmware.com/
- (Handouts will be given in class).

Cell phones:

Turn the ringer off, or, better yet, ***turn the phone off***.

Class Attendance:

Class attendance is highly recommended. You are responsible for all materials presented in class, quizzes, examinations, and other announcements. No excuses of any nature will be construed as relieving you from the responsibility for completion of the work assigned. Each student is responsible for completing all course requirements and for keeping up with all that goes on in the course (whether or not the student is present).

Final Grade:

Final grade will be determined using the following grading weights:

written assignments	38%
programming projects and presentations	30%
midterm examination	12%
final examination	20%

Attendance is not used to calculate the final grade: *however*, note that you are at all times responsible for assignments and materials presented in class.

Programming Projects and Presentations:

There will be several programming projects to be completed throughout the semester. The programming languages and platforms will vary (C/C++, Java,…/Windows, Linux…) and will be given out in class. These programming projects will help students understand the basic concepts of modern operating systems and get hands-on experience in the implementation of some functions of operating systems. There is a deadline to each programming assignment and 6% penalty will be imposed for each day a project submission is late (including weekends and holidays).

For each programming assignment, the following should be submitted: (a) a write-up which describes the problem, tells how to compile and run the program, and includes testing results; (b) printout of the code; (c) the code and possible input data (sent by email).

Programming project-related presentations and/or OS topics-related presentations will be assigned / determined in the middle of the semester. You will give presentations in class at the prescheduled times. There are no make-ups for missed presentations unless under extreme circumstances with advanced notification of the instructor and/or certain supporting documentation.

The programming projects and presentations will be announced in class and via email/course website.

Submission Deadlines/Late Penalties:

There are specific due dates/times for any assignments (written homework assignments, programming projects) and these assignments should be completed by the deadlines. A penalty of 6% will be applied for late submission for each day (including weekends and holidays). No missed presentations will be made up unless under extreme circumstances with advanced notification of the

instructor and/or certain supporting documentation.

All the assignments will be announced/given in class and through course website.

Exams:

There will be one midterm (12% total) and one final (comprehensive) exam (20% total). The midterm will be held in week 8 *depending* on class progress. The final exam will be on December 17, Thursday, 11:00am—1:00pm. **Note:** Make-ups are given for examinations only under exceptional and documented circumstances.

Missed Tests:

Missed tests will be made up *only under extreme conditions/emergency with the proper documentation*. Students who know in advance that they must be absent on an exam day for an excusable reason should notify the instructor prior to the exam day. Students who are absent on the day of the exam for an excusable reason should contact the instructor immediately following their absence. Makeup work will be permitted *only when* the instructor is presented with acceptable documentation for acceptable absences. It is your responsibility to notify your instructor of any excused absence as far in advance as possible.

Homework Assignments:

There will be a series of written assignments from the textbooks and other sources: question-answering and short essay-writing. Reading assignments will be a part of the written assignments. All assignments are due *at the beginning* of class on the dates to be set by the instructor. A 6% penalty will be imposed for each day (including weekends and holidays) an assignment submission is late.

One (written) assignment with the lowest grade will be dropped from the final grading.

Please note that these assignments constitute 38% of the final grade and that in addition to these (written) assignments there will be Programming Projects and Presentations assignments which make up 30% of the final grade.

Study Groups:

While I strongly encourage study groups, I require that each student hand in his/her answers in her/his own words - if two answers are highly similar to each other, neither will receive credit.

When working on your programming projects, you may discuss with others the project topics, the algorithms and methodologies related to the project; but when you work on the computer writing the code, this coding work should be 100% of your own work.

Academic Integrity:

Academic Integrity Policy and Regulations can be found in the College Catalog and on the College's website (http://www.salemstate.edu/content_images/academic_integrity_regulations_2007(1).pdf). The formal regulations are extensive and detailed - familiarize yourself with them if you have not previously done so. A concise summary of and direct quote from the regulations: "Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts". *Submission of other's work as one's own without proper attribution is in direct violation of the College's Policy* and will be dealt with according to the College's formal Procedures.

"Salem State College is committed to providing equal access to the educational experience for all students in compliance with Section 504 of The Rehabilitation Act and The Americans with Disabilities Act and to providing all reasonable academic accommodations, aids and adjustments. *Any student who has a documented disability requiring an accommodation, aid or adjustment should speak with the instructor immediately*. Students with Disabilities who have not previously done so should provide documentation to and schedule an appointment with the Office for Students with Disabilities and obtain appropriate services."

Please remember that if, for any reason, you decide to drop this course, you **MUST** do so officially through the Registrar's office. The last day to withdraw from a course this semester is **November 20th**.

Note: This syllabus represents the intended structure of the course for the semester. If changes are necessary, students will be notified in writing and via all regular class communication mechanisms (class discussion, emails, and/or the instructor's website at http://cs.salemstate.edu/~b_yi/.).