ESE333 Real Time Operating Systems Syllabus (Spring 2021)

1. Course Staff, Hours and Schedule

Instructor	**Jinho Hwang**
Course website	**Blackboard only**
Lectures	**Online** **Thu 6:05-9:10pm online via zoom (ID: 554 657 9618)** https://stonybrook.zoom.us/j/5546579618?pwd=a002NjVLTHYrbFpETjlWeEI0NWNpQT09
Office Hours	**Wed 6:00-8:00pm by Zoom (students need to request a time slot in advance)** ***Other hours by appointment***
Email	**JinHo.Hwang@stonybrook.edu**
Phone	**276-336-0971 (Note. please leave a text message if not responding)**
TA	**TBD**

2. Course Description

Introduction to the basic concepts and principles of real-time operating systems. The topics to be covered include operating system concepts and structures, multiple processes, interprocess communication, real-time process scheduling, memory management, virtual memory, file system design, security, protection, and programming environments for real-time systems.

Prerequisites: ESE 124 Computer Techniques For Electronic Design, CSE 214 Computer Science II and ESE 380 Embedded Microprocessor Systems Design I or CSE 220 Computer Organization and Systems Programming.

3. Student Learning Objectives

Upon completion of this course, students will be able to master knowledge of different operating system structures; knowledge of processes/threads and scheduling; knowledge of storage systems, including memory and file systems; operating system implementation and system programming skills

4. Contents

Operating systems are an essential part of a computer system. The goal of this course is to introduce the basic concepts and principles of general operating systems as well as real-time system issues. Major topics include

- Process: multiprogramming, state, implementation, scheduling.
- Interprocess communication: race conditions, critical sections, test and set lock, semaphores, semaphore implementation, shared memory, monitors, event counters, message passing, equivalence of primitives, synchronization.
- Scheduling: FIFO, round robin, priority, multiple queues, shortest job first, guaranteed, real-time scheduling.
- Memory management: base and bounds, swapping, paging, page replacement algorithms, segmentation, combined, working sets.
- File systems: file operations, attributes, seek problem, directories, I-nodes, consistency, performance, protection, security.
- Deadlock: conditions for deadlocks, resource allocation graphs, safe and unsafe states, banker's algorithm.
- Input and output: device controllers, device drivers, interleaving, disk arm scheduling.
- Case studies of real-time operating systems.

6. Course Materials

Modern Operating Systems, A.S. Tanenbaum, Prentice Hall, 4th edition, 2015 (required).

7. Homework and Exams

There will be approximately 6-8 written assignments. In addition, there will be 3-4 programming projects on Unix/Linux machines. In the programming assignments, students will intensively use system calls, implement multiple concurrent processes, interprocess communication in a UNIX/Linux environment.

There will be one midterm exam and one final exam, through online tool Respondus Lockdown browser and Black Board.

8. Grading

You will be graded by

Homework Assignment	10%
Programming Assignment	35%
Midterm	25%
Final	28%
Portfolio	2%

9. ABET Learning Outcomes

a) an ability to apply knowledge of mathematics, science, and engineering;
b) an ability to design and conduct experiments, as well as to analyze and interpret data;
c) g) an ability to communicate effectively;
d) a knowledge of contemporary issues, and
e) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

10. Americans with Disabilities Act

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, Room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential. http://studentaffairs.stonybrook.edu/dss/index.shtml.

11. Academic Integrity

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

12. Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.