

# Advanced System Software Design (OS)

## Course Description:

This course covers systems software design and implementation at the graduate level. Software systems mediate the interaction between hardware and software by i) securely multiplexing hardware resources between multiple independent tasks and II) providing abstractions that simplify software development. Topics include: process management, threading, synchronization, deadlock, scheduling, file system, I/O and GPU programming. The course will also include additional research readings on traditional systems concepts, multicore support, and GPU programming. The concepts in this course are not limited to any particular software system or hardware platform. We will discuss examples that are drawn from many historically significant and modern software systems.

## Course Prerequisites:

The prerequisites are including Systems Programming, Hardware Organization, and C Programming language.

## Course Objectives:

The objective of this course is threefold: i) to demystify the seemingly complex interactions between software and hardware, ii) to familiarize with advanced issues in the design and implementation of modern software systems, and iii) to understand how systems design principles apply to the design of computing systems, especially writing efficient and correct programs for multi-cores and multi-computers;

## Recommended Text Books

OSTEP: <http://pages.cs.wisc.edu/~remzi/OSTEP/>

## Grade Policy:

Attendance	5%
Midterm	20%
Final	25%
Project	30%
Assignments	20%
Bonus Points	9%

## Final Grade Distribution:

$\geq 96.00$	A+		
93.00 - 96.00	A	73.00 - 76.99	C
90.00 - 92.99	A-	70.00 - 72.99	C-
87.00 - 89.99	B+	67.00 - 69.99	D+
83.00 - 86.99	B	63.00 - 66.99	D
80.00 - 82.99	B-	60.00 - 62.99	D-
77.00 - 79.99	C+	$\leq 59.99$	F

## **Health and Wellbeing:**

During this time, you may be experiencing new stresses related to the COVID-19 pandemic in addition to other pressures such as health, money, family, and academic concerns or stress and trauma from societal inequities and violence. You are not alone at UMass - many people care about your wellbeing and many resources are available to help you thrive and succeed. The College recognizes that coursework is challenging and that classes are not the only demand in your life. Success in this course and the College of Engineering depends heavily on your personal health and wellbeing. Recognize that stress is an expected part of the college experience, and it often can be compounded by unexpected setbacks or life changes outside the classroom such as those related to COVID-19. I strongly encourage you to reframe challenges as an unavoidable pathway to success. Reflect on your role in taking care of yourself throughout the term, before the demands of exams and projects reach their peak. Please feel free to reach out to me about any difficulty you may be having that may impact your performance as soon as it occurs and before it becomes too overwhelming. I encourage you to contact support services on campus that stand ready to assist you. Please reach out to me for support finding the resources you need.

## **Disability Accommodation and Inclusive Learning Statement:**

Your success in this class is important to me. We all learn differently and bring different strengths and needs to the class. The University is committed to making reason-able, effective and appropriate accommodations to meet the needs of students with disabilities and help create a barrier-free campus. If you have a qualifying disability and require accommodations while participating in this course, please work with Disability Services to have an accommodation letter sent to me in a timely manner. If you have a disability but are not yet affiliated with Disability Services, please register with Disability Services. If you are eligible for exam accommodations, your exams will be administered by the exam proctoring center. Contact Disability Services immediately, and comply with their exam scheduling policies, including the requirement that you book your exams at least seven days in advance of the exam date. It is incumbent upon you contact me during the first few weeks of the semester, or shortly following registration with Disability Services, to ensure that your accommodations are being sufficiently met, including extra time and note-taking access, as applicable. Finally, beyond disability accommodations, if there are aspects of the course that prevent you from learning or make you feel excluded, please let me know as soon as possible. Together we'll develop strategies to meet both your needs and the requirements of the course.

## **Integrity:**

There is no place for a dishonest engineer! Please read and be aware of the academic honesty policy. While this isn't something that should arise, it is something we should be aware of and discuss as a class, as integrity is a core value of the engineering profession.

## **Inclusivity:**

The diversity of the participants of this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued or respected for any reason, please speak with me privately. If you wish to communicate with someone else in the College, speak with Assistant Dean Dr. xxx.

### **Pronouns and Names:**

Everyone has the right to be addressed by the name and pronouns that they use for themselves. Students can indicate their preferred/chosen first name and pronouns on SPIRE, which appear on class rosters. Please let me know what name and pronouns I should use for you if they are not on the roster. A student's chosen name and pronouns are to be respected at all times in the classroom.

### **Gender Respect and Title IX:**

The university aspires to be a university environment that is free of discrimination, sexual harassment, and sexual violence. Faculty have the responsibility to inform students of resources and reporting options. A report to the Title IX Coordinator may be made at any time (including during non-business hours) by using the Title IX Coordinator's email. Please reach out to me if you would like assistance connecting with any of these resources/options.