

CS 5323: Design and Implementation of Operating Systems II

Spring 2020

Instructor Information

Name: Sathyanarayanan Aakur
Office: MSCS 210
Email: saakurn@okstate.edu
Office Hours: MW 1:00 - 2:30 pm

Class Information

Dates: 13th Jan - 6th May
Time: MW 2:30 - 3:45 pm
Classroom: Classroom Building Room 101

TA Information

Name: Nandhini Velusamy
email: nandhini.veluswamy@okstate.edu
Office Hours: TBD
Office: TBD

Course Description

This course look into the important problems in operating system design and implementation. The operating system provides an established, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. The discussion will cover the trade-offs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems; and on operating system support for distributed systems.

Prerequisite

Prerequisites: CS 4323 or equivalent
Knowledge of Programming

Course Objectives

After this course, you should be able to . . .

- Further understanding of the principles of operating systems.
- Develop insight into process management and scheduling issues.

- Understand memory management operation.
- Develop an understanding of file system implementation and of multiple levels of hardware support and management.
- Develop a deep understanding of the concepts of cooperating processes, including communication, synchronization, and deadlock (detection and avoidance).
- Be able to evaluate operating system features.
- Develop an understanding of the distributed operating system environment.

Textbook, & Software

No particular book is *required* for this course. However, I would recommend the following books for reference.

Textbook 1: *Operating Systems Concepts, Ninth Edition*, by Silberschatz, Galvin, and Gagne published by John Wiley and Sons.

Textbook 2: *Operating Systems: Three Easy Pieces*, by Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau. Available online: <http://pages.cs.wisc.edu/~remzi/OSTEP/>.

For the projects you may want a book on C programming. It is expected that students in this class have basic prior experience with operating systems either through programming or undergraduate instruction.

Course Outline and Tentative Schedule

Week 1	Introduction
Week 2	OS structure, Processes, Inter-process communication
Week 3	Basics of Threads
Week 4	CPU Scheduling
Week 5	Critical Section, Process Synchronization, Semaphore
Week 6	Classic Problem, Deadlocks
Week 7	Deadlock, Memory Management, Test
Week 8	Paging, Segmentation, Virtual Machine
Week 9	Files, Mass Storage
Week 10	Disk, I/O System
Week 11	Spring Break
Week 12	I/O Systems
Week 13	Distributed Systems
Week 14	File Systems
Week 15	Protection
Week 16	OS System and Networks
Week 17	Pre-Finals week
Week 18	Finals week

Class Attendance and Participation

Attendance is strongly encouraged, but not required. Students are responsible for any material covered in class. Some of the material covered in class will not be in the textbook. Announcements about tests etc. will be made in class and/or by email. Students are to check their emails regularly (using their class accounts).

Assignments and Quizzes

If you need or desire an extension on any Assignment for any reason, contact your instructor in a timely fashion, as permitted by the need. There is no guarantee that you will receive an extension on any assignment, so plan your schedule carefully. **No late work is accepted!!** Any academic dishonesty will result in an F in the course. Programs must be individual and no help may be received or given without acknowledgment.

There will often be a weekly quiz. The quizzes will most often be given on Fridays, and sometimes Wednesdays. There will be a quiz for the topics covered in every week. Start preparing for quizzes before they arrive! *No make-up quizzes will be given.* Quizzes will be Open book and Open notes. It will be online on Canvas.

Exams

There is a mid term and a final exam. You are expected to be present, seated, and ready to take the exam before the exam begins. The midterm exam is scheduled for the week of February 19th. You are not permitted to use any outside materials, resources, or electronic devices (including but not limited to mobile phones, smartwatches, etc., but not including a calculator) on the exams. Any violation of this policy is a violation of the university's Academic Integrity Policy.

Grading

The course grade is determined by the following components:

Exam 1	25%
Assignment	25%
Quizzes	20%
Final Exam	30%

Final grades will be assigned according to the following scale,

Grade A	90-100%
Grade B	80-89%
Grade C	70-79%
Grade D	60-69%
Grade F	0-59%

DEPARTMENT POLICIES

Drop and Add Policy: Students will be allowed to drop as long as the University permits them to do so. A grade of W or F will be determined on the basis of the points earned until that time.

Academic Dishonesty/misconduct: The Computer Science departmental policy for academic dishonesty and misconduct applies to this class. In addition, a student attempting to gain unfair advantage by keeping an examination paper longer than the time permitted is guilty of academic misconduct.

Computer Usage: The Computer Science departmental policy for computer usage applies to this class. Exceptions will be made for students whose companies permit use of company machines for academic work. Students taking advantage of the exception must have two-way email access.

Americans with disabilities act: The Computer Science departmental policy for students with disabilities applies to this class. Anyone who has a need for examinations by special arrangements should see the instructor as the earliest possible opportunity during scheduled office hours.

Examinations/Tests: No discussion of any kind (except with the instructor) is allowed. No access to any type of written material is allowed. Students who do not comply with the described collaboration policy will receive a grade of F in the course. Furthermore, the case will be reported to the University Officials.

Important Dates

- University Holiday: 20th Jan 2020
- Midterm: 19th Feb 2020
- Last day to drop a course with no grade: 21st Jan 2020
- Academic Withdrawal Deadline: 24th Apr 2020
- Final Exam: TBD later in the semester



OKLAHOMA STATE UNIVERSITY

SYLLABUS ATTACHMENT

Spring 2020

<http://academicaffairs.okstate.edu>

YOUR SUCCESS AS A STUDENT IS OUR TOP PRIORITY.

THIS INFORMATION IS PROVIDED TO ANSWER QUESTIONS MOST OFTEN ASKED BY STUDENTS.

IMPORTANT DATES

Last day to add a class (without instructor permission)	01/21/2020
Last day to drop a course with no grade and 100% refund	01/21/2020
Last day to add a class (requires instructor & advisor permission)	01/24/2020
Last day to drop a course or withdraw from the University with an automatic "W" and receive a partial refund (requires advisor signature)	01/24/2020
Last day to post 6 week grades	02/26/2020
Last day to file graduation application (for name to appear in Spring Commencement program)	04/01/2020
Last day to drop a class or withdraw from the University with an automatic "W"	04/10/2020
Last day to withdraw from all OSU classes with an assigned grade of "W" or "F"	04/24/2020
Pre-Finals Week	04/27/2020-05/01/2020
Final examinations	05/04/2020-05/08/2020
Final grades due from faculty	05/13/2020

Note: Outreach, Internet, and short courses have unique drop/add and refund deadlines; lookup the specific deadlines for these courses on the Short, Internet, and Outreach Class Schedules page of the Registrar's website <http://registrar.okstate.edu/SIO-Schedule>.

Spring Semester Holidays

University Holiday	01/20/2020
Student's Spring Break	03/16/2020-03/20/2020

DROPPING A COURSE AND WITHDRAWING FROM THE UNIVERSITY.

students often confuse these terms.

Dropping a Course (or courses) may occur during the first twelve weeks of the semester. This means, however, that you are still enrolled in at least one other OSU course. Exceptions to the deadlines above may only be considered by petition due to documented extraordinary circumstances and committee approval. The Retroactive Drop/Withdraw Petition and the Petition for a Refund of Tuition and Fees forms are available on the Registrar's website <http://registrar.okstate.edu/Forms>.

Withdrawing from the university means dropping *all* courses and you *are no longer enrolled for the current semester*. This may occur until the Friday before pre-finals week. The withdrawal process is initiated with your academic advisor. For additional information and dates, go to: <http://academicaffairs.okstate.edu/content/adding-dropping-and-withdrawing-courses>.

ALERTS AND RESCHEDULING

If the OSU campus officially closes due to inclement weather or other emergencies, alerts are provided to local news media and posted on the OSU website. Missed exams, classes, or assignments may be rescheduled at times outside the normal meeting schedule. If valid, documented circumstances prohibit students from attending the rescheduled classes, instructors should provide reasonable alternative means for makeup.

SEEK ANSWERS TO YOUR QUESTIONS

The OSU faculty and staff want you to be successful in your educational pursuits. If you have questions or concerns, seek help EARLY. We are here to assist you.

ACADEMIC INTEGRITY

101 Whitehurst/405-744-5627/<http://academicintegrity.okstate.edu>
OSU is committed to maintaining the highest standards of integrity and ethical conduct. This level of ethical behavior and integrity will be maintained in this course. Participating in a behavior that violates academic integrity (e.g., unauthorized collaboration, plagiarism, multiple submissions, cheating on examinations, fabricating information, helping another person cheat, unauthorized advance access to examinations, altering or destroying the work of others, and altering academic records) will result in an official academic sanction. Violations may subject you to disciplinary action including the following: receiving a failing grade on an assignment, examination or course, receiving a notation of a violation of academic integrity on your transcript, and being suspended from the University. You have the right to appeal the charge.

COPYRIGHT & FAIR USE POLICY OF COURSE MATERIALS

Course materials may not be published, leased, sold to others, or used for any purpose other than appropriate OSU-related individual or group study without the written permission of the faculty member in charge of the course and other copyright holders. This paragraph grants you a limited license giving you access to materials for this course, including PowerPoint slides, audio/video recordings, written, or other materials, for appropriate OSU-related educational use only. Lectures should not be recorded without permission from the faculty member and must not be further disseminated or shared.

CLASS ATTENDANCE

Class attendance is a critical component of learning; therefore, you are expected to attend and participate fully in all scheduled class meetings. Many instructors consider attendance so essential that your grade may be affected by your absence. *SOME DEPARTMENTS AND PROFESSORS HAVE MANDATORY ATTENDANCE POLICIES*. If no written attendance policy is provided before the last day to add a class without instructor permission, no penalty may be assessed for class absences although you may not be permitted to make up certain in-class activities. If you are required to participate in official university-sponsored activities or military training, you should receive an excused absence unless the written course attendance policy indicates otherwise. If you will be absent from class for sponsored activities, you must provide prior notification of the planned absence to the instructor. You may be required to submit assignments or take examinations before the planned absence.

PRE-FINALS WEEK POLICY

Final examinations are scheduled at the end of each semester and are preceded by pre-finals week, which begins seven days prior to the first day of finals. During pre-finals week, all normal class activities will continue; however, no assignment, test, or examination accounting for more than 5% of the course grade may be given; and no activity or field trip may be scheduled that conflicts with another class. This excludes makeup and laboratory examinations, out-of-class assignments (or projects) made prior to pre-finals week and independent study courses. No student or campus organization may hold meetings, banquets, receptions, or may sponsor or participate in any activity, program, or related function that requires student participation. For additional information, contact the Office of Academic Affairs, 405-744-5627, 101 Whitehurst.

FINAL EXAM OVERLOAD POLICY

In the event you have three or more final exams scheduled for a single day, you are entitled to arrange with the instructor of the highest numbered course (4 digit course number) or two highest, if you have four finals on one day, to re-schedule that examination(s) at a time and place of mutual convenience during final exam week. If the final exam overload includes a common final exam, the common final exam is excluded from rescheduling unless multiple common exams are scheduled at the same time. You should submit this request in writing, with a copy of your class schedule, at least two weeks prior to the beginning of final exam week. The instructor has one week prior to the beginning of final exam week to arrange a mutually convenient time and place for administration of the final exam. After one week, if an agreement cannot be reached, take the request to the department head.

INFORMATION TECHNOLOGY

Student Email - OSU uses your OKSTATE.EDU email address as a primary form of communication. Students are expected to check their OSU email on a frequent and consistent basis to remain informed of their official university business. If you do not use the OSU email system you must redirect your okstate.edu email using the Orange-Key System (www.okey.okstate.edu). Failure to maintain an accurate email address may result in missed or lost university communications. For email assistance contact the IT Helpdesk at 405-744-HELP (4357).

Computer Labs - A complete description of computer labs and hours of operations are available at their website:

<https://it.sp.okstate.edu/technologysupport/deskside/public/labs.htm>.

Lab information is also available by calling the Information Technology Help Desk at 405-744-HELP (4357).

EQUAL OPPORTUNITY

409 General Academic Building/405-744-7607

<https://iis2many.okstate.edu/>

OSU is committed to maintaining a learning environment that is free from discriminatory conduct based on race, color, religion, sex, sexual orientation, gender identity, national origin, disability, age or protected veteran status. OSU does not discriminate on the basis of sex in its educational programs and activities. Examples of sexual misconduct and/or sex discrimination include: sexual violence, sexual harassment, sexual assault, domestic and intimate partner violence, stalking, or gender-based discrimination. OSU encourages any student who thinks that he or she may have been a victim of sexual misconduct or sexual discrimination to immediately report the incident to the Title IX Coordinator (405-744-7737) or Deputy Title IX Coordinator (405-744-5470). Students may also report incidents of sexual misconduct or sex discrimination to a faculty or staff member, who is then required by federal law (Title IX) to notify the Title IX or Deputy Title IX Coordinator. If a reporting student would like to keep the details confidential, the student may speak with staff in the Student Counseling Center (405-744-5472) or one of the University's Sexual Assault Victim Advocates (Mon-Fri 8 AM-5 PM, 405-564-2129 or 24 Hour Help Line 405-624-3020).

STUDENT DISABILITY SERVICES

1202 W. Farm Rd #155/405-744-7116/<http://sds.okstate.edu/>

According to the Americans with Disabilities Act, each student with a disability is responsible for notifying the University of the disability and requesting accommodations. If you think you have a qualifying disability and need accommodations, contact the Office of Student Disability Services to start the registration process and to ensure timely implementation of appropriate accommodations. To receive services, you must submit appropriate documentation and complete an intake process to verify the existence of a qualified disability and identify reasonable accommodations. Faculty have an obligation to respond when they receive official notice of accommodations but are under no obligation to provide retroactive accommodations.

STUDENT CONDUCT EDUCATION AND ADMINISTRATION

328 Student Union/405-744-5470/<http://studentconduct.okstate.edu/>
By enrolling at Oklahoma State University, you accept responsibility for complying with all University policies and contracts, and for local, state and federal laws on- or off-campus that relate to the University's mission. **The Student Code of Conduct** educates students about their civic and social responsibilities including policies and procedures involving student misconduct.

In general, the University expects students to aspire to follow and promote the Cowboy Community Standards or integrity, community, social justice, respect, and responsibility.

EDMON LOW LIBRARY HOURS

405-744-9775 or 405-744-9741

www.library.okstate.edu

Text 405-592-4128

Sunday

Noon-7:00 PM

Monday-Thursday

7:30 AM-10:00 PM

Friday

7:30 AM-6:00 PM

Saturday

Noon-7:00 PM

*For holiday and intersession hours, check

<http://library.okstate.edu/about/hours>

*Contact the following for information on hours of operation:

Architecture Library	405-744-6047
Curriculum Materials Library	405-744-6310
Veterinary Medicine Library	405-744-6655

WHERE TO GO FOR HELP

ACADEMIC RELATED SERVICES

Instructor - If you have questions regarding your class, talk to your instructor. Faculty members usually include their office hours and/or phone number in the class syllabus. If you cannot locate this information, set a time to meet with your instructor by speaking with him/her prior to or immediately following your class session or check with the departmental office on when the instructor may be available.

Academic Advisor - All students will benefit by conferring with an advisor on a regular basis. If you do not know your advisor or would like to learn more, talk to the Student Academic Services Director for your college.

Bursar

113 Student Union/405-744-5993

<http://bursar.okstate.edu/>

The Bursar Office bills and collects tuition, fees, campus housing, and other university related charges. The Bursar Office also processes and disburses all federal and campus-based funds to students' bursar accounts and refunds any overpayments on students' bursar accounts.

Career Services

360 Student Union/405-744-5253

<http://hiresugrads.com>

Locate your College's Career Consultant on the Career Services website. Use <http://hiresugrads.com> to search for part-time jobs.

Concurrent Student Services and Advising

University College/040 Student Union/405-744-1389

<http://universitycollege.okstate.edu/concurrent/index.html>

Find out about academic services for concurrent students or to schedule your next advising appointment.

Foreign Language Placement Test

206 Gunderson Hall/405-744-9547

<http://languages.okstate.edu/>

Students with prior foreign language experience in French, German, or Spanish who take the placement exam and then score a 'B' or higher in a more advanced class, will get up to 6 credit hours for the classes below it. Schedule your free test by emailing Nick Howland at nick.howland@okstate.edu.

Multicultural Affairs

240 Student Union/405-744-5481

<http://oma.okstate.edu/>

Academic, career, and personal success programs are available. Student organizations representing diverse communities and annual events are offered.

Pre-Professional Academic Support Services

University College/040 Student Union/405-744-9965

<https://preprofessional.okstate.edu>

Support services available to all OSU students, regardless of major who desire to pursue a professional education in health care or law.

Registrar

322 Student Union/405-744-6876

<http://registrar.okstate.edu/>

The Office of the Registrar provides services related to the creation and maintenance of student academic records. We are here to assist students with enrollment, official transcript requests, degree and enrollment verification, updating personal information in the Student Information System, graduation, and other services.

Scholarships & Financial Aid

119 Student Union/405-744-6604

<http://financialaid.okstate.edu>

Over 80 percent of Oklahoma State University students received scholarships, grants, work, and low-interest loans totaling over \$320 million last year. Contact the Office of Scholarships & Financial Aid to apply for financial aid or to meet with a financial aid counselor.

Transfer Students Services

University College/104 North Classroom Building/405-744-1390

<http://universitycollege.okstate.edu/transfer/index.html>

This office provides undergraduate transfer students with a seamless transition to OSU by collaborating with various departments on campus, including the Office of Undergraduate Admissions, the LASSO Center, the Office of the Registrar, and Financial Aid.

University Assessment and Testing

107 University Assessment and Testing Building/405-744-5958

<http://uat.okstate.edu/>

Campus and national tests as well as testing accommodations are provided.

Veteran Benefit Services

322 Student Union/405-744-6343

<http://registrar.okstate.edu/Veteran-Benefit-Services>

This office provides information and assistance in completing the appropriate forms to apply for educational benefits through the U.S. Department of Veterans Affairs and through the State of Oklahoma.

Veteran Student Academic Services

University College/104 North Classroom Building/405-744-1390

<http://universitycollege.okstate.edu/veteran/index.html>

This office works with veteran and military-affiliated students to aid in their transition from military service to successful careers by ensuring they succeed academically through coordination of support services from both on- and off-campus entities.

HEALTH RELATED SERVICES

Counseling Psychology Clinic

107 Public Information Office/405-744-6980

https://education.okstate.edu/ccp_clinic/index.html

Faculty and graduate students offer high quality and cost efficient psychological and mental health services to students Monday through Friday.

University Counseling Services

320 Student Union/405-744-5458

<https://ucs.okstate.edu/>

Services include personal counseling, the Alcohol & Substance Abuse Center, and stress management through the Reboot Center.

University Health Services

1202 W. Farm Road/405-744-7665

<http://uhs.okstate.edu/>

An allergy clinic, lab services, x-ray, travel clinic, women's clinic and pharmacy are among the services offered at this campus outpatient medical clinic.

Wellness Department

405-744-5510

<http://wellness.okstate.edu/>

Intramurals, group fitness and sports clubs are among the many programs and services available through the Wellness Department.

CAMPUS LIFE RELATED SERVICES

Fraternity & Sorority Affairs

211J Student Union/405-744-5490

<https://lcl.okstate.edu/gogreek/>

For questions and comments about fraternity and sorority organizations, contact Fraternity and Sorority Affairs.

Housing & Residential Life

100 Iba Hall/405-744-5592

<http://reslife.okstate.edu>

For questions and comments about housing and residential life, contact the Housing administration office.

Leadership and Campus Life

211 Student Union/405-744-5488

<http://lcl.okstate.edu>

Get involved through student organizations; the Center for Ethical Leadership; International Students & Scholars; Non-traditional Student Services; and Parent & Family Relations.

Service-Learning Volunteer Center

211G Student Union/405-744-5145

<https://lcl.okstate.edu/volunteer/>

Find volunteer opportunities and earn the recognition C.O.R.D. to wear at graduation.

University Dining Services

076 Student Union/405-744-4424

<http://dining.okstate.edu/>

For questions and comments about meal plans or university dining operations, contact University Dining Services.

ACADEMIC SUPPORT RESOURCES AND TUTORING

Learning and Student Success Opportunity (LASSO) Tutoring Center

021 Classroom Building/405-744-3309

<https://universitycollege.okstate.edu/lasso/>

LASSO offers free individual and group tutoring for a variety of courses.

STUDENT ACADEMIC SERVICES CENTERS

Agricultural Sciences & Natural Resources

136 Agricultural Hall/405-744-5395

Contact: Dr. Deb VanOverbeke

<http://casnr.okstate.edu/students/ssc>

Academic support and career guidance resources are available for CASNR students.

Arts & Sciences

213 Life Sciences East/405-744-5658

Contact: Dr. Amy Martindale

<https://cas.okstate.edu/advising>

Academic support and career guidance resources are available for Arts & Sciences students.

Education, Health & Aviation

106 Willard Hall/405-744-6350

Contact: Ms. Kristi Seuhs

<http://education.okstate.edu/watson>

Academic support, advisement and career counseling is available to all education majors.

Engineering, Architecture & Technology

111 Engineering North/405-744-5276

Contact: Mr. Lance Millis

<https://studentservices.okstate.edu/advising>

Academic advising and career services are available for all CEAT students. Tutoring is offered for general math, science, and engineering courses.

Human Sciences

101 Human Sciences/405-744-5053

Contact: Ms. Kristi Seuhs

<https://humansciences.okstate.edu/academics/center-student-success.html>

Academic support and career guidance resources are available for Human Sciences students.

Spears School of Business

155 Business Building/405-744-2772

Contact: Ms. Marissa McIntyre

<https://business.okstate.edu/student-services/>

Academic advisement is provided for freshmen through seniors in all business major areas.

University College Advising

214 Student Union/405-744-5333

Contact: Ms. Missy Wikle

<https://universitycollege.okstate.edu/uca/>

University College Advising has academic advisors to help with your academic needs, whether planning your semester schedule, teaching your First-Year Seminar class, looking at degree options, or helping to bridge the gap between student life and academic success. Call or visit the office anytime Monday through Friday, between 8:00 a.m. and 5:00 p.m.

DISCIPLINE SPECIFIC TUTORING**Accounting**

416 Business Building/405-744-2863

<https://spears.okstate.edu/accounting/ace/>

Support is provided to all students enrolled in classes offered by the OSU School of Accounting.

Biology

303 Life Sciences West

<http://biol1114.okstate.edu>

Tutoring is provided for BIOL 1114.

College of Engineering, Architecture & Technology Tutoring

ENDEAVOR 102/405-744-1750

<https://studentservices.okstate.edu/coaching>

Tutoring is provided for Engineering and Engineering Science courses.

The Language Lab

205 Gunderson Hall/405-744-9547

<http://languages.okstate.edu/>

Two 28-user labs fully equipped with personal computers and listening/recording devices are available. Students may practice vocabulary building and grammar in the target language.

Graduate Research and Writing Lab

306 Edmon Low Library/405-744-1241

<http://info.library.okstate.edu/RLS/grads>

Offers one-on-one consultations, workshops, and other services for graduate students.

History

101 S Murray Hall/405-744-5680

<http://history.okstate.edu/contact>

Tutoring is given for Survey of History and upper division courses.

Mathematics Learning Success Center

5th Floor Edmon Low Library/405-744-5818

<https://mlscokstate.com/>

The MLSC provides drop-in tutoring for all students enrolled in 1000 and 2000 level mathematics classes.

Writing Center

440 Student Union/405-744-6671

<http://osuwritingcenter.okstate.edu>

The Writing Center helps writers throughout the composing process; plan to visit early and often throughout the semester, not just the day before an assignment is due. Tutors work with students to improve brainstorming, organizational, and composing techniques. Multiple locations are available on campus, as well as online tutoring.

FOR MORE INFORMATION**go.okstate.edu/apps**

The OState app is your link to campus departments, OSU news, and maps. The Orange Shield app is the official safety app of OSU.

my.okstate.edu

This portal connects students to a wide range of campus services including links to student email, the library, and the Online Classroom and Community (D2L).

For other comments and inquiries, please contact academics@okstate.edu.