Tentative Course Plan and Syllabus
CS 4323: Design and Implementation of Operating Systems I

Course Credit: 3.000

Instructor: Dr. Shital Joshi
Class Schedule: Monday and Wednesday (2:30 PM to 3:45 PM)
Class Venue: Agricultural Hall 275
Email: shital.joshi@okstate.edu
Office: MSCS 229
Office Hours: Monday (12:30 PM to 01:30 PM)
Wednesday (11:30 AM to 12:30 PM)
TA: TBD (@ostatemail.okstate.edu)

Prerequisites:

- CS 2133 and CS 3443 or ECEN 3213 or ENSC 3213 and CS 3653 and CS 4343

Course Description:

The course covers the key concepts in modern operating systems. The specific topics include process management, synchronization mechanisms, scheduling strategies, deadlock detection/avoidance and prevention, memory management, file systems, protection and security. Concepts will be reinforced through hands-on application of reading assignments and lecture materials through homework assignment, including programming projects and case studies involving Windows and Unix operating system.

Course Objectives:

Upon the successful completion of the course, the students will be able to:

- Describe components of operating system and its interaction.
- Evaluate various policies for scheduling, deadlock, memory management, synchronization, system calls and file systems.
- Design and construct various OS software components like system calls scheduler, memory management and file management.

Student Outcomes:

- An ability to apply knowledge of computing and mathematics appropriate to the discipline.
- An ability to analyze problem and identify and define the computing requirements appropriate to its solution.
- An ability to design, implement and evaluate a computer-based system, process, component or a program to meet desired needs.
- An ability to function effectively on teams to accomplish a common goal.

Text Book:

- Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley & Sons, Inc. ISBN: 978-1-119-43925-7.

Knowledge Areas that contain topics and learning outcomes covered in the course:

Knowledge Area (KA)	Total Hours of coverage
Operating Systems (OS)	26
System Fundamentals (SF)	5
Networking and Communication (NC)	3

Body of Knowledge coverage:

KA	Knowledge Unit	Topic Covered	Hours
OS	Overview of Operating Systems	Role and purpose of OS, Key design Issues	1
OS	Operating System Principles	Processes, Process control, threads, interrupts and context-switching	3
OS/SF	OS Scheduling and Dispatch, Resource allocation and scheduling	CPU scheduling, dispatcher, Scheduling policies, Deadlines, real-time concerns	4
OS	Concurrency	Basics of exclusive and synchronization, Interrupts, deadlocks, pthreads interface	4
OS	Memory Management	Storage systems, memory management, working sets and thrashing; latencies, caching, locality, cache consistency, fault handling	5
OS	File System	Files (metadata, operations, organization, etc), standard implementation techniques, file system partitioning, virtual file systems, memory mapped files, log structured file system	2
OS	Device Management	Serial and parallel devices, device drivers, interfaces, direct memory access, recovery from failure	3
OS	Security and Protection	Overview of system security, policy, access control, protection and authentication	2
OS	Virtual Machines	Paging and virtual memory, virtual file system, virtual devices and I/O, virtualization and its tradeoffs, hypervisor design	4

SF	Virtualization and Isolation	Rationale for protection and predictable performance, levels of indirections, methods of implementing virtual memory and virtual machines	3
NC	Reliable data delivery	OS role in reliable data delivery	1
NC	Networked application	Role of layering, role of OS in network naming scheme	1
NC	Routing and Forwarding	Role of OS in routing and forwarding	1

Course Gradings:

Grading Criteria		Grading Scale	
Assignments	30% (30 points)	90% -- 100%	A
Attendance + Class Participation	10% (10 points)	80% -- 89.99%	B
Project	15% (15 points)	70% -- 79.99%	C
Quizzes	35% (35 points)	60% -- 69.99%	D
Final Exam	10% (10 points)	Less than 60%	F
Total	**100% (100 points)**		

Note: The total grades shown in canvas may NOT reflect the proportions above. So, do your own calculation for grades using the proportions.

Assignments and Group Project:

There will be 4 programming assignments throughout the semester and a final group project.

Late penalty is 10% per class day. Assignments turned after a week (5 working days) late from the due date will not be accepted.

All the due dates (given at the end) are fixed. Release dates however can be moved earlier, if required.

Assignment Submissions rules and practices:

1) All home assignments will be submitted **ONLY** through canvas.

2) When naming your home assignments, you **MUST** use the naming convention below:
a. The folder should be named as: Assignment**_LastName_FirstName_XX. **(where ** means assignment number and XX means question number)**
Example: **Assignment01_Andrew_Simon_03**
Failure to submit in this order will automatically results in 5 points deduction.

3) You are encouraged to review the assignments when assigned (even if you don't have time to work on them right then). This way you can plan out your week and get your questions answered early. Please note that **not all assignments will be of same complexity**.

4) Any extra effort (in terms of introducing new ideas or concepts, detailed implementation and so on) will be encouraged and may be rewarded with extra bonus points.

Attendance:

Attendance is very important for this class. Late arrival is not encouraged. Students are responsible for knowing all the **verbal (announcement)** and written information provided by the instructor during class, including those are posted on the course web page.

Course and Class regulations:

If you are having trouble understanding a concept, please contact me inside the class or in my office during office hours. Please feel free to make constructive suggestions at any time including making comments anonymously.

I encourage, and reward, individual efforts to build a community of active learners. Efforts to participate in class will be awarded **points** in the class.

- Deadlines are final and must be met. It is your responsibility to allocate time accordingly. Absolutely NO excuses will be accepted like computer crashes. Ensure that you have enough backups to allow for the worst-case scenarios, such as loss of your homework or project.

- Exams: No make-up exams will be given unless an acceptable University-approved excuse is provided promptly.

- Collaboration for assignments are allowed only in terms of concepts, ideas or techniques are allowed. However, each student needs to have their own implementation, write-ups and approach. Any violation of academic integrity would result in a zero grade for the assignment and a report to the university administration. Major violation will result in a grade F.

- Please adhere to professional behavior in class. Refrain from side conversations, surfing the internet on personal devices, answering phones/ texting, etc.

- Students with disabilities who may require reasonable accommodations should contact Office of Disabled Student Service, 326 Student Union. Please advice the instructor of such disability and the desired accommodation at some point before, during or immediately after the first scheduled class period.

Advice for performing well in this class

- Attend the class regularly and turn in the assignments well in time.
- Keep up with the weekly assignments, since many of the concepts build upon each other.
- Review the assignments when assigned (even if you don't have time to work on them right then). This way you can plan out your week and get your questions answered early. Do not wait until the last minute to work on an assignment at home.

OSU Academic Integrity Policy:

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. Go to http://academicintegrity.okstate.edu/ for a video on OSU's academic integrity policy and additional information.

Tentative Course Schedule:

Class	Date	Topics	Chapter (Quizzes/Assignment)
Week 1	08/19	Introduction	1
	08/21	Introduction	1
Week 2	08/26	Operating System Structure	2 (Assignment01)
	08/28	Operating System Structure	2
Week	09/02	University Holiday	
3	09/04	Process	3 (Quiz 01 on chapters 1, 2)
Week 4	09/09	Process	3 (Assignment01 Due)
	09/11	Process	3 (Assignment02)
Week 5	09/16	Threads and Concurrency	4 (Quiz 02 on chapter 3)
	09/18	Threads and Concurrency	4
Week 6	09/23	CPU Scheduling	5 (Quiz 03 on chapter 4)
	09/25	CPU Scheduling	5 (Assignment02 Due)
Week 7	09/30	Synchronization Tools	6 (Quiz 04 on chapter 5) (Assignment03)
	10/02	Synchronization Tools	6
Week 8	10/07	Synchronization Examples	7
	10/09	Synchronization Examples	7
Week 9	10/14	Deadlocks	8 (Quiz 05 on chapters 6, 7)
	10/16	Deadlocks	8 (Assignment03 Due)
Week 10	10/21	Deadlocks	8 (Assignment04)
	10/23	Main Memory	9 (Quiz 06 on chapter 8)
Week 11	10/28	Main Memory	9
	10/30	Virtual Memory	10
Week 12	11/04	Virtual Memory	10 (Assignment04 Due)
	11/06	Mass-Storage Structure	11 (Quiz 07 on chapters 9, 10)
Week 13	11/11	Mass-Storage Structure	11 (Group Project Assigned)
	11/13	File-System Interface	13
Week 14	11/18	File-System Implementation	14
	11/20	File-System Implementation	14
Week	11/25	University Holiday	
15	11/27	File-System Internals	15
Week 16	12/02	File-System Internals	15
	12/04	Final Exam Review	(Group Project Due)
Wednesday, December 11 (2:00 PM – 3:50 PM) Final Exam			

- This is just a tentative course schedule. It may evolve throughout the semester.
- Concepts of I/O data transfer, security and protection will be discussed sometimes within these time frame.