

CMSC 421 – Principles of Operating Systems
Tuesday/Thursday 2:30PM - 3:45PM
Information Technology/Engineering 102

Instructor: Mr. Lawrence Sebald (lsebald1@umbc.edu)

Office Hours: Tuesday/Thursday 10:00AM - 11:30AM and by appointment in ITE 368

TA: Vaishnavi Jamdade (vjamdad1@umbc.edu)

Office Hours: TBA

TA: Asavari Arunrao Deokar (adeokar1@umbc.edu)

Office Hours: TBA

Course Description:

An introduction to the fundamentals of operating systems. Topics include interprocess communication, process scheduling, deadlocks, memory management, virtual memory, file systems and distributed systems. Formal principles are illustrated with examples and case studies of one or more contemporary operating systems.

Course Website:

<https://bluegrit.cs.umbc.edu/~lsebald1/cmsc421-sp2020/>

<https://piazza.com/umbc/spring2020/cmsc421>

Textbooks:

Required: Operating System Concepts (10th Edition). Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne. Wiley, 2018 – ISBN-13: 978-1-119-45633-9.

Optional: The C Programming Language (2nd Edition). Brian W. Kernighan and Dennis M. Ritchie. Prentice Hall, 1988. – ISBN-13: 978-0-131-10362-7.

Optional: Linux Kernel Development (3rd Edition). Robert Love. Addison-Wesley, 2010. – ISBN-13: 978-0-672-32946-3.

Prerequisites:

(CMSC 341 or CMSC 341H) and (CMSC 313 or (CMPE212 and CMPE310)) all with a grade of C or better.

Topics to be covered:

- Operating System Structures
- Processes, Threads, Synchronization, Scheduling, and Deadlocks
- Memory Management and Virtual Memory
- I/O, Storage, and Filesystems
- Protection and Security
- Special Topics

Course Objectives:

At the core of the software of any computer system is that computer's operating system kernel. The kernel is responsible for maintaining the state of the various processes running on the computer, managing the computer's memory, delegating access to hardware, and many other core tasks. Because of its major role in managing the computer systems, developing a deep understanding of operating system design principles is essential in the study of computer science.

In this course, students will learn the fundamental concepts of operating systems, including design and implementation techniques. Students will also develop skills to apply the concepts learned in practical applications through several programming projects.

Required Work:

You are expected to complete all assignments for the course. Assignments will consist of three exams (including a comprehensive final exam), three programming projects, and several homework assignments. Assignments must be submitted by the given due date to have the possibility to receive full credit

In addition to the assigned work for the course, you are expected to attend class regularly and participate in class discussions. Pop quizzes may be given in-class at the instructor's discretion and cannot be made up if missed.

Grading Policy:

Student grades will be determined as follows:

Assignment	Weight
Homework, Class Participation, Quizzes, Attendance, etc.	15%
Project 0	5%
Project 1	10%
Project 2	20%
Exam 1	15%
Exam 2	15%
Final Exam	20%
Total	100%

Your final grade for the course will be determined by the weighted average of your scores on the assignments, determined by the weighting shown above. Grades will be assigned on the standard letter grade scale, as follows:

$[90, 100] \implies A$; $[80, 90) \implies B$; $[70, 80) \implies C$; $[60, 70) \implies D$; $[0, 60) \implies F$.

The instructor reserves the right to curve both final and individual assignment grades. If any curve is applied, it will only be to the benefit of the students.

A grade of Incomplete will only be issued under specific situations as directed by university policy. Failure to complete assignments by the prescribed due date is not a sufficient reason to grant a grade of Incomplete.

You must take all exams and hand in a reasonable attempt at all projects in order to pass the course. While meeting this requirement does not guarantee a passing grade, failing to meet it will result in a grade of F.

Exams:

There will be three exams in this course, including a comprehensive final exam. All exams will take place in the normal classroom, unless you are otherwise informed by the instructor. The final exam will be comprehensive, however it will be slightly biased toward the material presented after the second exam.

If you expect to miss an exam, you must make prior arrangements with the instructor for a make-up exam. You must have a documented excuse (for instance, a doctor's note) for missing an exam.

Discussing any exam with a student who has not already taken the exam is cheating and will be dealt with in accordance with the UMBC Academic Integrity policy.

Late Policy:

All assignments are to be completed by the due date posted with the assignment. However, we do realize that sometimes things happen and an you may miss the due date of the assignment. You may turn in assignments up to five days late with a penalty of 10% off of your score per day (or any portion of a day) that the assignment is turned in late. That is to say, if an assignment is due by 11:59PM on March 1st, and you turn it in at 12:01AM on March 2nd, you will lose 10% off of your grade. For a more concrete example, if you would have received a 95% on an assignment, but you turn it in between [24, 48) hours late, you will receive a final score of 75% on the assignment. If you anticipate that you will turn an assignment in late, please let the TAs and the instructor know as soon as possible so that you do not receive a 0 on the assignment by mistake.

Any portion of a day that an assignment is turned in late will trigger the late penalty. That means even if you turn the assignment in 0.1 seconds late, you will be penalized. Failure to turn an assignment in by 5 days after the assignment is due will result in a score of 0 on the assignment.

Late submissions may be approved by the instructor without penalty for valid excuses. If you have some sort of emergency that prevents you from turning in an assignment on time, please contact the instructor by email as soon as possible to work out an alternate plan for turning in the assignment. The instructor may require documentation of the excuse (for instance a doctor's note) before approving a late submission in these cases.

Course Discussions:

This semester, we will be using Piazza for class-related discussion. If you cannot sign up for the course Piazza, please notify the instructor as soon as possible. You should check the Piazza regularly as the semester progresses.

The Piazza board for this class is shared with all sections of the course this semester, and occasionally information specific to one section of the course may be posted on Piazza. Please be sure when you join the course Piazza board that you add yourself to the Section 02 group to ensure that you receive any material posted that is only relevant to our section of the class.

You are welcome to use Piazza to discuss course material, including homework assignments. However, you should be careful to not violate the academic integrity policy in your discussions on Piazza. You are forbidden from posting any answers to homework assignments on the Piazza discussion board. Also, you should not publicly post any code for the projects on Piazza without prior approval from the instructor – please see the TAs or instructor in our office hours for direct assistance with code.

The instructors and TAs will attempt to monitor the responses posted on Piazza by students, however it is not the responsibility of the staff to verify the fine points of student responses.

Homework and Project Policies:

The following policy items apply to all homework assignments and projects assigned in this course:

- You are responsible for keeping up with assignments and other coursework. Homework assignments and the project assigned in this class will demand a significant amount of time to complete. You should start on all assignments as soon as they are assigned to guarantee that you will have the required time to complete the assignment.
- Just to emphasize the point: **start on assignments as soon as they are assigned**. Your projects especially will require a significant effort and a significant amount of time to complete.
- Assignment descriptions, due dates, etc. will be posted on the course website. Failure to check the website is not an acceptable excuse for missing an assignment or not adhering to the assignment's instructions.
- You are expected to complete each assignment individually. You are allowed to discuss the concepts behind assignments, however absolutely no direct collaboration on answers or code is allowed unless otherwise specified in the assignment description.
- Any written (non-code) portions of assignments must be typed using a word-processor of your choice. The only acceptable file formats for written portions of assignments are the PDF format or plain ASCII or UTF-8 text. PDF documents should be formatted as Letter (8.5in x 11in) or A4 (210mm x 297mm) sized pages. If you wish to submit plain text documents, no lines should contain more than 80 characters (you must manually word-wrap your plain text documents) and the file must use UNIX-style (LF) line endings. Failure to meet these requirements may result in a lower grade on the assignment or a grade of 0 for repeated offenses. **You are not allowed to submit any assignments in Microsoft Word (.doc or .docx), Apple Pages, LibreOffice or any other such format. Convert these documents to PDF for submission.** Written portions of homework assignments will be submitted using the course Blackboard.
- Code portions of assignments will be submitted on GitHub (<https://github.com/>). You must have a GitHub account in order to turn in assignments, so if you do not already have an account with GitHub, please sign up for one at your earliest convenience. You are welcome to use an already existing GitHub account, but please be sure to associate your UMBC email account with the GitHub account to ensure that we will be able to tell which student each assignment belongs to.
- You may be asked to explain your solutions to assignments to the instructor. Failure to demonstrate an understanding of the solution that you provided is considered a violation of the UMBC Academic Integrity policy.
- While we do not have a strict coding standard for this class, you should strive to write readable code. The easier it is for the TA to understand your code, the easier it will be for them to grade the code. In addition, if the TA can understand your code, it will be easier for them to give you partial credit for parts of your code that may not work perfectly. Thus, it is in your best interest to ensure that your code is readable, well-formatted, and well-commented.

- It is also in your best interest on coding assignments to explain your code in README files, including telling us if portions of your code do not quite work correctly. Explaining what does and does not work with your code, as well as explaining your thought process can help the TA do their job and can help us to help you with constructive comments on how to improve. This is especially true if you are asking for help on an assignment (in office hours or by email).
- As we are using the Git version control system for submitting projects, it is highly recommended that you commit code early and often. Some assignments may have commit requirements (requiring you to submit code in portions some number of times). If this is the case, these are only minimums. You may (and are indeed encouraged to) commit and push to your git repositories as often as you wish. **Committing early and often can be of extreme importance in case something goes wrong with your VM – you can always pull your code back down from GitHub in a new VM if needed.**

Lab Resources:

For this class, you may request card-swipe access to the computer lab in ITE 240. These computers have virtual machine software installed on them which will allow you to work on your projects. You are highly encouraged to have a USB hard drive or USB flashdrive of adequate size (at least 32 GB) in order to allow you to store your VM images so that you can use them on your personal machines as well as those in the ITE 240 lab.

Please note that this lab is shared amongst many courses in the Computer Science department. Please respect all other students who may be using the lab if you choose to use the lab yourself. **Even if you do not intend to use the lab, it is still a good idea to have a USB storage device to use for backing up your VM image.**

Academic Integrity Policy:

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Undergraduate Student Academic Conduct Policy, consult the following URL:

<https://academicconduct.umbc.edu/>

There is no tolerance for academic dishonesty in this course. Any and all acts of academic dishonesty will be treated severely, as prescribed in the UMBC Undergraduate Student Academic Conduct Policy.

The instructional staff of the course reserves the right to run cheat-checking software over any and all submissions for the course. We would much prefer if we did not have to resort to using such means, however.

ADA Compliance:

We recognize that some students may have disabilities that require special attention from the instructional staff. Please inform the Office of Student Disability Services (<https://sds.umbc.edu>) of any accommodations that are needed so that appropriate arrangements can be made.

Title IX Information:

Any student who has experienced sexual harassment or assault, relationship violence, and/or stalking is encouraged to seek support and resources. There are a number of resources available to you.

With that said, as an instructor, I am considered a *Responsible Employee*, per UMBC's Policy on Prohibited Sexual Misconduct, Interpersonal Violence, and Other Related Misconduct. This means that while I am here to listen and support you, I am required to report disclosures of sexual assault, domestic violence, relationship violence, stalking, and/or gender-based harassment to the University's Title IX Coordinator. The purpose of these requirements is for the University to inform you of options, supports, and resources.

You can utilize support and resources even if you do not want to take any further action. You will not be forced to file a police report, but please be aware, depending on the nature of the offense, the University may take action.

If you need to speak with someone in confidence about an incident, UMBC has the following Confidential Resources available to support you:

The Counseling Center: 410-455-2742 (Monday - Friday 8:30AM - 5:00PM)

University Health Services: 410-455-2542 (Monday - Friday 8:30AM - 5:00PM)

For after-hours emergency consultation, call the police at 410-455-5555

Other on-campus supports and resources:

The Women's Center (available to students of all genders): 410-455-2714 (Monday - Thursday 9:30AM - 6:00PM, Friday 9:30AM - 4:00PM)

Title IX Coordinator: 410-455-1606 (Monday - Friday 9:00AM - 5:00PM)

Child Abuse and Neglect:

Please note that Maryland law requires that I report all disclosures or suspicions of child abuse or neglect to the Department of Social Service and/or the police.