COMP SCI 354 section 003
Machine Organization and Programming

COURSE INFORMATION

Machine Organization and Programming
COMP SCI 354 003 (3 Credits)
2022 Spring [1224]

Description
An introduction to fundamental structures of computer systems and the C programming language with a focus on the low-level interrelationships and impacts on performance. Topics include the virtual address space and virtual memory, the heap and dynamic memory management, the memory hierarchy and caching, assembly language and the stack, communication and interrupts/signals, compiling and assemblers/linkers. Enroll Info: None

Prerequisite(s)
COMP SCI/ECE 252 and (COMP SCI 300 or 302) or graduate/professional standing or declared in the Capstone Certificate in Computer Sciences for Professionals

Breadths
N - Natural Science

Instruction Mode
Classroom Instruction

Section Level Com B
False

Department: Computer Sciences
College: Letters and Science

2022 Spring [1224]
Term Start Date: Tuesday, 23-Nov-2021  Term End Date: Wednesday, 15-Jun-2022

Location and Schedule: Brogden Psychology Building 113 MW 2:30 PM-3:45 PM
CRN: 838141224

How Credit Hours are Met:

How Credit Hours are Met
This class meets for two 75-minute class periods or one 180-minute class period each week over the semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying,
etc.) for about 10-12 hours out of classroom every week. The time individual students will spend varies greatly primarily based on student's prior experience programming in C.

Regular and Substantive Student-Instructor Interaction:

Students get direct instruction during in-person class meetings each week and quantitative feedback via learning assessments including quizzes, two midterm exams, and a final exam. Students can get additional instructor feedback and assistance during office hours and via appointments. Students get feedback on their programming work via teaching assistant review, scoring, and commenting.

Other Course Information:

Usage of Audio Recorded Lectures Statement

Lecture materials, assignments, quiz questions, and recordings for CS354 Machine Organization and Programming are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use.

If a lecture is not already recorded, you are not authorized to record lectures without instructor permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or share lecture materials and recordings outside of class, including posting on internet sites or sharing or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized sharing or use of copyrighted materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

INSTRUCTORS AND TEACHING ASSISTANTS (TAs)

Instructors

Rahul Uday Chakwate  
✉ CHAKWATE@WISC.EDU

Debra DEPPELER  
✉ DEPPELER@WISC.EDU

Matthew Kingston  
✉ MLKINGSTON@WISC.EDU

Sam Kottler  
✉ SKOTTLER@WISC.EDU

Instructor Availability and Preferred Contact:
Students may meet with instructor after most class meetings, during in-person office hours, remote office hours, and by appointment. See the Lectures link on the Canvas course web site for current schedule and links. Note: I much prefer to meet in-person or remotely rather than trying to help students practice and demonstrate skills via email.

TA Availability and Preferred Contact:

Students may work in the Linux instructional labs in the CS building and meet with teaching assistants during TA Consulting. See TA Consulting link on course web site for current schedule. On campus students may meet with undergraduate peer mentors for additional practice and for help forming study groups. See PM Activities link on course web site for events and schedule of availability.

COURSE OUTCOMES, GRADING, and OTHER COURSE MATERIALS

Course Learning Outcomes (CLOs):

- Implement and interpret C programs using standard tools, and relate C language constructs to both x86 assembly language and fundamental computer system structures.

- Differentiate the memory segments of a process's virtual address space and explain how each is used in C programs.

- Describe and diagram how the heap works internally, analyze the performance of heap allocation strategies, and implement in C a dynamic memory manager.

- Demonstrate how the memory hierarchy functions, differentiate different memory cache implementations, and appraise the affects of memory caching on the performance of C programs.

- Diagram a stack trace of execution for C programs, and explain how the compiler implements the stack with x86 assembly language code.

- Formulate C programs that send and receive signals and respond to exceptional circumstances, and explain the underlying mechanism that enables asynchronous execution.

- Identify and summarize the steps of C program compilation, and describe the processes of linking object code modules to form an executable and loading executables to run them.
Grading:

Final grades are based on final overall percentage in the course. The final percentage is a weighted percentage based on exams, projects, and homework quizzes.

- **Component weights**: Exams 55%, Projects 30%, Homeworks 15%
- **Letter Grades are assigned at end of semester after all assigned work has been submitted and graded.**
- **Final Grade cutoffs are based primarily on the exam difficulty and may be curved based on actual difficulty of exams and grading of assigned work.**
- **Lecture attendance in-person is highly recommended as is finding classmates to practice and review with each other.**

Course Website, Learning Management System and Digital Instructional Tools:

Course web site: [https://canvas.wisc.edu/courses/280042](https://canvas.wisc.edu/courses/280042)

- Chrome web browser is required for all course quizzes.
- Google Meet and Zoom may be used for remote meetings with instructor, teaching assistants, and peer mentors.

Discussion Sessions:

- Lecture 003 is taught on campus on MW 2:30PM - 3:45PM in 113 Psychology
- Lecture 010 is taught off campus on W 6:00 - 9:00 PM in Phoenix room of EPIC’s Voyager Learning Center

We ask that Lecture 003 students contact TAs during the **003 TA consulting** hours as the Lecture 010 Office Hours and **010 TA** will prioritize assisting Lecture 010 students.

Required Textbook, Software, & Other Course Materials:

- A terminal app that can be used to remote connect to CSL Linux workstations.
  - MAC USERS: can typically use the built-in **Terminal** app.
  - Windows Users: must typically install **MobaXterm**, **PuTTY**, or another app that permits secure shell remote connections. See campus technology guidelines and recommendations for instruction.

Recommended for students who with to get more practice understanding and writing C code.

- ZYBOOKS (Online C Programming Activities)
  - Sign in or create an account at [https://learn.zybooks.com](https://learn.zybooks.com)
  - Enter zyBook code: WISCCOMPSCI354ECE354DeppelerSpring2022
  - Subscribe
  - A subscription is **$58**. Students may begin subscribing on Jan 18, 2022 and the cutoff to subscribe is May 05, 2022. Subscriptions will last until Jun 04, 2022.

Homework & Other Assignments:

*Homework assignments must be done individually and **NOT** as part of a pair or group.*
• **Canvas quizzes** - give you the opportunity to answer questions in the way that you will be required to do for the exams. Complete quizzes as if you're taking an exam and be sure to use Chrome web browser. Trace the code manually. Draw diagrams. Think through the questions without relying on your notes, textbooks, computers, or others. You are allowed to use notes and books on quizzes, but not exams. Quizzes attempts must be completed before the availability date, or student will not be able to see the questions.

• **FlipGrid videos** - short 1-2 minute videos where you answer a question or demonstrate your understanding of a topic or concept. Peer-Review for kudos and suggestions.

• **Quizlets** – when available give you a chance to practice understanding terminology that is used in the course. These are typically a subset of terms that were used in lecture and we want to help you confirm your understanding. To get credit for any required quizlets, you typically save and submit a screenshot image showing that you completed the activity.

• **Worksheets and Practice quizzes** – [optional] give you a chance to complete a worksheet of problems or activities that should help demonstrate that you are keeping pace in the course and understanding the smaller parts that are need to complete larger assignments. These may be problems that were presented in lecture, or samples of homework quiz problems, or textbook problems.

Projects are larger programming assignments that must be done individually and **NOT** in pairs or groups.

**They provide opportunity to develop skills and apply concepts for each unit of the course.**

**Concepts required for each project are covered before it is assigned so that you may begin the day it is assigned.**

• Projects are published on Canvas and must be done using the CS Department's Instructional Linux Computers. You’re provided a CS login to access these computers to do your work. Login remotely using the `ssh` command or an `ssh client such as MobaXterm`.

• Project work is submitted by copying from your Linux account to your local machine, and then uploading to Canvas, or simply via Linux `scp` command. The last section of each project specifies what to submit and how to check your submission.

• Projects are graded on the CS Department’s Instructional Linux Computers. Make sure your work runs as described on CSL computers.

**Projects are to be done individually.** You may discuss the concepts covered in these projects but **not the code.**

Questions about your code are best handled during TA Lab Consulting or PM Activities, and your code must not posted publicly to Piazza or other forums.

**ACADEMIC CONDUCT**

• **It is academic misconduct** to share your work with others in any form and at any time while taking or after completing CS 354. This especially includes posting your solutions on publicly accessible web sites, such as GitHub, Chegg, Course Hero, PasteBin, and others.

  *Note: Your personal CS 354 work may be shared with potential employers so long as it is shared privately and not in a public repository, e.g., use a private cloud-based drive such as Google’s.*

• **It is academic misconduct** for you to copy or use some or all of a program that has been written by someone other than what we’ve provided in the code skeleton.

**LATE WORK**

**Late Projects are only accepted with prior instructor approval.** You must email instructor at least three days in advance of the deadline with an explanation of your extraordinary circumstance. If an extension is granted, it will be for 1-2 days, and you will be required to provide verification of your circumstance.

If the emergency occurs within the last 3 days of an assignment, an extension may be possible if a partial solution has been submitted and the extension needed is less than 24 hours.

**Extraordinary circumstances beyond your control do NOT include:**
• Having other school work including exams: This is the normal circumstance of being a student. Plan ahead to manage your time accordingly so that you’re able to complete a project or most of it for partial credit.

• Being sick a few days including on the due date: Getting sick is to be expected. Start early and submit partially complete work to ensure any illness doesn’t prevent you from completing a project or at least getting partial credit for what you have completed prior to becoming ill.

• Having other commitments including employment: Balancing our commitments is a normal part of life. Choose your priorities and do your best to complete a project or most of it for partial credit.

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**EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK**

Exams, Quizzes, Papers & Other Major Graded Work:

*Exams are a primary tool we use to evaluate your performance in this course.* Your UW WISCCARD photo identification card is required to take exams. Exams will be two hours in duration. Exams are closed book with some reference material provided as needed. Follow instructions as given for each quiz and exam.

- **Midterm 1 (15%)**: Week 5, Wednesday, February 23rd, 2022, 7:30 PM - 9:30 PM
- **Midterm 2 (18%)**: Week 10, Wednesday, April 6th, 2022, 7:30 PM - 9:30 PM
- **Final Exam (22%)**: Final Exam: Tuesday, May 10, 2022, 5:05 PM – 7:05 PM

**Format: Exams are proctored in person.** Written exams may be composed of multiple parts. In such cases, Simple choice questions are typically two points each and cover terms and concepts. Multiple choice questions are typically three points each and require code tracing, diagramming, and concepts that require multiple steps. Written questions may include fill-in-blank, diagram completions, and other computations.

Midterm exams are not cumulative except as required for new content. Final exam is cumulative with a focus on new material, typically 70% new, 30% prior material.

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**ADDITIONAL COURSE INFORMATION AND ACADEMIC POLICIES**

**Teaching & Learning Data Transparency Statement**

The privacy and security of faculty, staff and students’ personal information is a top priority for UW-Madison. The university carefully reviews and vets all campus-supported digital tools used to support teaching and learning, to help support success through learning analytics, and to enable proctoring capabilities. View the university’s full teaching and learning data transparency statement.
Privacy of Student Records & the Use of Audio Recorded Lectures Statement

View more information about FERPA.

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How to Succeed in This Course

Resource links to other campus services:

- University Health Services
- Undergraduate Academic Advising and Career Services
- Office of the Registrar
- Office of Student Financial Aid
- Dean of Students Office
- Graduate Student Services

Course Evaluations

Students will be provided with an opportunity to evaluate this course and your learning experience. Student participation is an integral component of this course, and your confidential feedback is important to me. I strongly encourage you to participate in the course evaluation.

Digital Course Evaluation (AEFIS)

UW-Madison uses a digital course evaluation survey tool called AEFIS. In most instances, you will receive an official email two weeks prior to the end of the semester, notifying you that your course evaluation is available. In the email you will receive a link to log into the course evaluation with your NetID. Evaluations are anonymous. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.
Students’ Rules, Rights & Responsibilities

Rights & Responsibilities

For spring 2022, instructors and students should consult the following website for current campus health and safety guidance: covidresponse.wisc.edu.

Diversity & Inclusion Statement

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

Academic Integrity Statement

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

Accommodations for Students with Disabilities

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (UW-855) require the university to provide reasonable accommodations to students with disabilities to access and participate in its academic programs and educational services. Faculty and students share responsibility in the accommodation process. Students are expected to inform faculty of their need for instructional accommodations during the beginning of the semester, or as soon as possible after being approved for accommodations. Faculty, will work either directly with the student or in coordination with the McBurney Center to provide reasonable instructional and course-related accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (See: McBurney Disability Resource Center)

Academic Calendar & Religious Observances

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