# CPE 221: Computer Organization
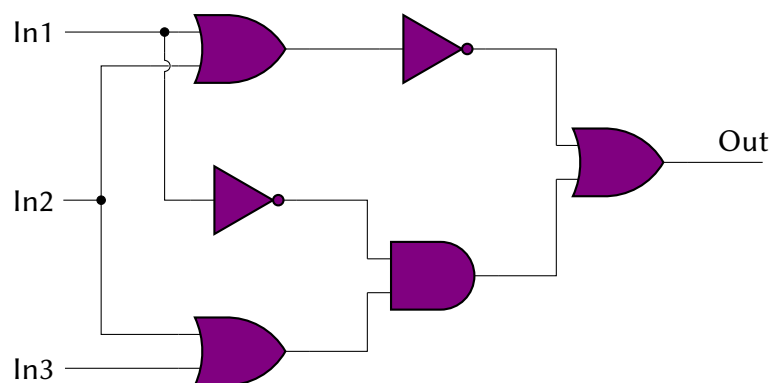
## Instructor: Rahul Bhadani

**Day/Time: Mon/Wed 04:20PM 05:40PM**
**Location: SST 105**
**Spring 2025**

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| **Instructor** | Rahul Bhadani |
| **Office** | ENG 217-H |
| **Office Hours** | Mon/Tue/Wed 2:00 PM - 4:00 PM |
| **Email** | rahul.bhadani@uah.edu |
| **Reference(s)** | Required *Digital Design and Computer Architecture: ARM Edition*. |
| | David Harris, Sarah Harris |
| | Morgan Kaufmann, 2016. |
| | ISBN-13: 978-0128000564 |
| | |
| | Required *ARM assembly simulator (CPUlator, VisUAL2).* |
| **Prerequisites** | CPE211, Concurrent w/EE202 |
| **Mid Term 1:** | February 19, 2025, Wednesday |
| **Mid Term 2:** | April 2, 2025, Wednesday |
| **Final Exam:** | May 2, 2025, Friday (3:00 pm to 5:30 pm) |



## Catalogue Description

Functional organization of stored-program digital computers including number representation, assembly language programming, computer hardware, micro-operations, and control logic; microprocessor architecture.

## Course Learning Outcome

- Represent integers via their unsigned binary representation and via their two's complement signed binary representation.

- Write ARM assembly language programs.

- Trace stack activity during the execution of an ARM assembly program, tracking values of the stack pointer, frame pointer, and all the elements in the stack throughout program execution.

- Implement instruction execution using concrete register transfer notation using a given computer datapath.

- Calculate the number of cycles necessary to execute a series of instructions in a pipelined architecture.

- Place each data item in a cache while identifying whether the access is a hit or a miss given a list of memory accesses.

- Become familiar with the basics of hardware description languages such as Verilog.

## Summary of your responsibilities as an active participant in this course

Commit to taking part in every single class meeting. Commit to being engaged by switching off your mobile devices. Commit to learning the material in advance by performing the reading assignments without distraction. Commit to starting your homework and quizzes early by reading the homework descriptions before you start working on the code. Commit to helping everyone in the class by actively engaging in all the in-class exercises — even if you don't understand the topic, and even if you understand the topic better than everyone (including the instructors).

Commit to being an engaged member of this class, and your reward will be a deeper understanding of your own abilities and a deeper appreciation of how you can succeed in your career through committing to do better.

## Course Outline

The listing of weekly course lecture topics may be found on the course webpage and is subject to change without notice due to class progress. In the event of a class cancellation, advance notice *via email* will be given, but any homework due that day will still be due unless otherwise notified via email.

# Grade Policy

As your instructor, I do not "give" grades: I assign the grade that you earn—based on your individual performance. You will not be competing with other students for your grade for all assignments in this course: your grade is solely based on the points you earn, in the below-weighted categories:

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|---|---|
| **Homework** | 30% |
| **Attendance/Quiz/In-Class Participation** | 10% |
| **Exam 1** | 15% |
| **Exam 2** | 15% |
| **Final Exam** | 30% |

| Grading Scale | |
|---|---|
| **Percentage** | **Grade** |
| 90% - 100% | A |
| 80% - 89% | B |
| 70% - 79% | C |
| 60% - 69% | D |
| 0% - 59% | F |

The percent score will be rounded to the nearest integer before assigning the final grade.

# Students with Disabilities

The University of Alabama in Huntsville will make reasonable accommodations for students with documented disabilities. If you need support or assistance due to a disability, you may be eligible for academic accommodations. Apply here or contact Disability Support Services (256.824.1997 or Wilson Hall 128) as soon as possible to coordinate accommodations.

# Technology Statement

This course will use UAH's learning management system, Canvas, as well as other technology tools. Students will be expected to have access to a computer with internet capabilities in order to fully participate in this course.

## ARM Simulator

There are several free options available that include a view of memory, registers, and have debugging capabilities. I recommend CPUlator (https://cpulator.01xz.net/) and VisUAL2 (https://tomcl.github.io/visual2.github.io/). You are welcome to use any simulator you wish, but you will need to verify that your programs compile and execute in one of the two tools listed above

## Course Websites

**Main Website** http://uah.instructure.com/

## Homework Submission Policy

You must submit all of the code, data, and pdf files in a zip folder (i.e., not rar, 7z, etc) on Canvas. If the submission requires only a single file, it doesn't need to be zipped. Assignments must be submitted as a zip file with code and a pdf document with your solutions! You must include a single PDF file (not doc, docx, or multiple JPEG figures of the pages from your homework) with the solutions. Failure to follow any/all of these policies leaves the instructor the option not to grade the homework based on a failure to follow the homework submission policy. Your zip and pdf should be named as follows {firstname.lastname}_CPE221_hw01.pdf. For example, if your name is Sam Wells, your file name should be sam.wells_CPE221_hw01.pdf. If zip file is needed, then it should only be named as sam.wells_CPE221_hw01.zip.

## Missed Assignments/Make-Ups/Extra Credit

Late homework assignments or quizzes will incur a 10% penalty per day past the deadline. Students are encouraged to begin working on assignments as soon as they are posted. Extra credit assignments will not be offered.

## Attendance, Participation, and Quizzes

Attendance is mandatory. Although the class roll will be taken every day, pop quizzes or class handouts *may* be given without notice. Pop quizzes may not be made up, though a certain

number may be dropped. In-class exercises will serve as objective measures of your participation and attendance, and may not be made up. Expected absences for valid reasons (e.g., travel to a conference) *must be cleared in advance* to avoid penalty for missing participation.

## Attendance Policy

All students are expected to arrive on time and attend lectures. If there are extenuating circumstances, please email the instructor. If you are absent, you are responsible for learning the material covered in class. If you are absent when an assignment is due, you must have submitted the assignment before the due date to receive credit. Please contact your instructor if you have specific questions or concerns.

# Class Disruptions

Please silence your cell phone, and do not use it during the class. The use of a phone in class will adversely affect your attendance grade[*].

# Academic Integrity

Students are expected to do all work by themselves, except when specified by the instructor in writing. All exceptions will be plainly marked in the requirements for that exercise or project. Any violations of this policy will be dealt with to the full extent permitted by the University of Alabama in Huntsville, and *may result in suspension or expulsion from the university, in addition to a failing grade.* Please familiarize yourself with the Code of Academic Integrity if you have any questions.

# Communication & Instructional Continuity

In this class, the official mode of communication is through the Slack channel. During the week, students can expect a response from the instructor within a 24-48 hour timeframe. Messages sent during the weekend may not be answered until the following week. On occasion, response times may vary due to domestic and international travel for conferences or meetings.

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[*]Uh, um, unless you are programming it as part of an in-class exercise. But please no talking or texting. Unless, uh, that is part of the class exercise too.

In the event a regularly scheduled course is unexpectedly interrupted, course requirements, due dates, and grading policy are subject to change when necessitated by revised course delivery, semester calendar, or other instances. Information about changes in this course can be obtained from the Canvas course webpage or by contacting me. If, under these circumstances, I do not respond within 72 hours, please contact my department at ece@uah.edu.

If our regularly scheduled class meeting is interrupted or the campus unexpectedly closes, students should immediately log onto Canvas and read any course announcements. Students are encouraged to continue the readings and other assignments as outlined on the course syllabus until otherwise advised. Any student who does not could fall behind in the course.

## Course Conduct

All students must treat others with civility and respect and conduct themselves in a way that does not unreasonably interfere with other students' learning opportunities. All communication between student and instructor and between student and student should be respectful and professional.

## Academic Honesty

Your written assignments and examinations must be your own work. Academic misconduct will not be tolerated. Examples of unacceptable behavior include plagiarism/use of prior work/use of Chegg and other online problem-solving sites/etc. To ensure that you are aware of what is considered academic misconduct, you should review carefully the definitions and examples provided in the Student Handbook. If you have questions in this regard, please contact me without delay.

## Course Artificial Intelligence (AI) Policy

You are allowed to use a generative model-based AI tool for your assignment. However, you must submit an accompanying reflection report detailing how you used the AI tool, the specific query you made, and how it improved your understanding of the subject. You are also required to submit screenshots of your conversation with any large language model (LLM) or equivalent conversational AI, clearly showing the prompts and your login avatar. Some conversational AIs provide a way to share a conversation link, and such a link is desirable for authenticity. Failure to do so may result in actions taken in compliance with the plagiarism policy.

Additionally, you must include your thoughts on how you would approach the assignment if such a tool were not available. Failure to provide a reflection report for every assignment where an AI tool is used may result in a penalty, and subsequent actions will be taken in line with the plagiarism policy.

## Safety Instructions

The frequent operation of a computer, such as will be required in this course, may have long-term disabling effects if you do not appropriately consider your ergonomic interaction with the computer, desk, chair, and light sources. Poorly designed workstations/practices can lead to musculoskeletal disorders and may result in chronic pain, inability to sleep, or expensive surgery decades from today. The habits you form in your university years may well impact your future performance, and it is highly recommended that you consult with the office risk management and compliance https://www.uah.edu/rmi.

## Disability Statement

The University of Alabama in Huntsville will make reasonable accommodations for students with documented disabilities. If you need support or assistance due to a disability, you may be eligible for academic accommodations. Apply here or contact Disability Support Services (256.824.1997 or Wilson Hall 128) as soon as possible to coordinate accommodations.

## Mental Health Statement

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities.

The University of Alabama in Huntsville offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Department of Student Affairs located under the Health and Wellness or the UAH Counseling Center by calling 256.824.6203.

24-hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1.800.273.TALK or at suicidepreventionlifeline.org or a student who lives on-campus can reach

out to the UAH PD dispatch to contact an on-call counselor by calling 256.824.6596. If you find yourself in a mental health emergency, call 6911 on-campus or 911 off-campus.

## Pertinent UAH Policies & Guidelines

- UAH Student Handbook

- Academic Misconduct Policy

- Complete listing of UAH Policies and Procedures

- AI and the Classroom

## Campus Resources

The University of Alabama in Huntsville offers a range of student services to enhance the experience of students.

- Academic Support Services – ASAP, Student Success Center, Tutoring, PASS, Academic Support Centers by College

- Student Support Services – Counseling Center, Disability Support Services, Student Health Services, Office of International Services, Multicultural Affairs, etc.

- UAlert—Sign up for UAH's emergency notification system to receive urgent messages from the university

- Registrar's Office – Academic Calendars, Course Registration, Student Records, Commencement

- M. Louis Salmon Library – Printed and Online Resources, Reference Services, Group Study Rooms, AV Resources, Printing

- Canvas Support – Call 844-219-5802 to report an issue with Canvas.

- OIT Help Desk – For technical support, contact the OIT Help Desk (helpdesk@uah.edu; 256.824.3333)

NOTE: When submitting a support ticket include your name, your class, the element/assignment being affected, and a detailed description of the issue. Providing a screenshot is often very helpful in diagnosing an issue.

## Important Dates

Review the semester dates and deadlines and the academic calendar.

## Subject to Change

Every effort is made to follow the guidelines in the syllabus; however, if needed, the syllabus will be amended. You will be notified if changes are made.

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I reserve all federal and state copyrights in my lectures and course materials. You are authorized to take notes in class for your personal use and no other purpose. You are not authorized to record my lectures to make any commercial use of them or to provide them to anyone else other than students currently enrolled in this course, without my prior written permission. In addition to legal sanctions for violations of copyright law, students found in violation of these prohibitions may be subject to University disciplinary action under the Code of Student Conduct.