CSE230 Computer Organization and Assembly Language :: Syllabus

Disclaimer: this page is the official syllabus for the course; paper copies will not be distributed. During the semester, changes may be made to the syllabus. If the change is significant, notification will be given in class, and an announcement will be made in Canvas. Minor editing changes will not be announced. The student is responsible for reading this syllabus at the beginning of the semester to acquaint himself or herself with the course policies, and for checking the syllabus periodically throughout the semester for relevant information.

Instructor and Office Hours

Instructor: Steven Osburn
Office: Online via Zoom
email: sdosburn@asu.edu
Office Hours: Discord: https://discord.gg/DeJyM58YcG

Catalog Course Description

Register-level computer organization. Instruction set architecture. Assembly language. Processor organization and design. Memory organization. IO programming, Exception/interrupt handling. *Prerequisite: CSE 120 or EEE 120 with C or better; CSE 100, 110 or 200 with C or better OR Computer Science or Computer Systems Engineering Graduate student; Credit is allowed for only CSE 230 or EEE 230. Three (3) credit hours. Lecture/No lab.*

Required Textbook

CSE 230: Computer Organization & Assembly Language zyBook. This is an interactive electronic textbook. This textbook is required for the course, and you cannot complete the assignments without it.

Extra material and supplemental material may be made available through Canvas and through other course resources like Inscribe.

Expectations

CSE 230 is an exceptionally rigorous and challenging course.

15 Week Course

If you are taking this course in a 15 week format, you should plan to spend at least 10 hours per week working on the various activities in this course. It is highly recommended that you should schedule your 10 hour per week as follows:

- 4.0 hr/wk – Content (reading, videos, activities) in required textbook
- 4.0 hr/wk – Individual programming assignments
- 2.0 hr/wk – Study Hall and Office Hours

7.5 Week Course

If you are taking this course in a 7.5 week format, you should plan to spend at least 20 hours per week working on the various activities in this course. It is highly recommended that you should schedule your 20 hour per week as follows:

- 8.0 hr/wk – Content (reading, videos, activities) in required textbook
- 8.0 hr/wk – Individual programming assignments
- 4.0 hr/wk – Study Hall and Office Hours

Major Topics Covered in this Course

Chapter 1: Computer Abstractions and Technology

- What is "computer organization?"
- The five classic components of a computer system.
- Defining performance.
- Measuring performance.
- The classic CPU performance equation.
- Performance and the power consumption wall.
- Multiprocessors and parallel computing.
- Expected time devoted to this chapter in the lectures is two weeks.

Chapter 2: Instructions: Language of the Computer

- Instructions and instruction sets. Instruction set architecture (ISA).
- Operations and operands.
- Representing signed and unsigned integers.
- Encoding instructions.
- MIPS logical instructions.
- MIPS instructions for making decisions.
- Supporting procedures in computer hardware.
- Representing characters and strings.
- MIPS addressing modes.
- Instruction decoding.
- MIPS assembly language example programs.
- Expected time devoted to this chapter in the lectures is four weeks.
- Chapters 1-2 will be six weeks.

Chapter 3: Arithmetic for Computers

- IEEE 754 single and double precision floating point formats.
- Expected time devoted to this chapter in the lectures is one week.
- Chapters 1-3 will be seven weeks.

Chapter 4: The Processor

- The basic MIPS implementation instruction set.
- Review of digital logic design conventions.
- Building the single cycle datapath.
- Adding the control to the single cycle datapath.
- An overview of pipelining.
- Pipeline hazards.
- The MIPS pipelined datapath and control.
- Detecting and handling data and control hazards.
- Expected time devoted to this chapter in the lectures is four weeks.
- Chapters 1-4 will be eleven weeks.

Chapter 5: Large and Fast: Exploiting the Memory Hierarchy

- Memory hierarchy and the principle of locality.
- Memory technologies: RAM (SRAM and DRAM), ROM (Flash).
- Cache basics. Direct mapped caches.
- Measuring and improving cache performance.
- Set and fully associative caches.
- Reducing the miss penalty using multilevel caches.
- Virtual memory and implementing protection with virtual memory.
- Expected time devoted to this chapter in the lectures is three weeks.
- Chapters 1-5 will be fourteen weeks.

Chapter 6: Parallel Processors from Client to Cloud (If Time Permits)

- Parallel programming, the speed-up problem, and Amdahl's Law.
- SISD, SIMD, MISD, and MIMD architectures.
- Hardware multithreading.
- Multi-core and other shared memory processors.
- Expected time devoted to this chapter in the lectures is one week.
- Chapters 1-6 will be fifteen weeks.

Course Objectives

1. Describe the overall components of a system
2. Use MIPS assembly language instructions, and write assembly language programs for simple problems, including function calls.
3. Explain the data representation (2's complement, single and double precision float point) inside the processor, and perform arithmetic operations on them.
4. - Compare the working of a single-cycle, multi-cycle, and pipelined processor. Students should be able to construct and appreciate more complex architectures.
5. Identify the importance and impact of pipelining, as a concept and as applicable to processor architecture.
6. Defend the concept and the rationale behind the memory organization, especially caches.
7. Apply the metrics of performance and throughput, and quantitatively compare two computers.
8. Explain how interrupts and exceptions are handled by the processor.

Tips for Success

Students who are most successful in CSE 230 will:

- Follow the schedule recommended in the Expectations section of this syllabus above
- Read the upcoming sections in the textbook ahead of time to first introduce terms and concepts
- Attend every lecture and/or participate actively (taking notes and asking questions)
- Review the material in the text again to make sure it is clear
- Read and begin assignments early so you can ask questions well ahead of the deadline
- Use the available help systems when help is needed
- Go to Study Hall and Office Hours
- Review and study past assignments, and textbook content in preparation for exams

Course Web Site

All documents associated with this course will be made available through your My ASU Home page and ASU's Canvas portal system. All students who are registered in this course should be able to access the course material through ASU's portal. If you experience any difficulty, please contact the ASU Experience CenterLinks to an external site. for technical support. It is your responsibility to access, complete, and submit your assignments from the course Canvas web site. Start working on the assignment as soon as possible. You should start early on your assignments so you can get help in time, if you need it. You should also check the announcement page often as the semester progresses.

Getting Help

This course includes a comprehensive set of help resources to support you and to ensure your success. The list of available help resources is provided on the Get Help page in Canvas. It is very important that you should seek appropriate help as soon as possible. If you are struggling with some concept or assignment, do not expect things to get easier or to make more sense as the semester progresses. Take full advantage of the available help resources. Start early on all assignments so that you have time to use the available help resources when you need them and to get the help you will need to be able to complete the assignments on time.

Assessment and Grading

Various methods will be used to present the material and assess the student's understanding and comprehension. **No extension of the due date will be granted** for any Reading Activity, Quiz, Individual Coding Assignment, or Exam.

Textbook Reading Activities

These Reading Activities have fixed due dates. Reading Activities must be completed before the due date passes in order to receive any credit for them. There is **no make-up for any missed Textbook Reading Activity**.

The lowest Reading Activities score will be dropped from your final grade calculation – even if that score is a zero.

Quizzes

There will be a number of quizzes to be taken throughout the semester. **In no case (never), will a makeup quiz be given if you miss one for any reason**.

The lowest Quiz score will be dropped from your final grade calculation – even if that score is a zero.

Individual Coding Assignments

For each Individual Assignment you are required to complete a programming project which will be submitted in the required interactive textbook for grading. These are not small projects that can be started and completed the night before they are due. You will need to spend significant time designing, coding, and testing your project. Before each assignment, is it your responsibility to complete all assigned reading and attend all lectures. Failure to complete the reading or attend the lectures may make it very difficult (or impossible) to successfully complete the assignments. You are strongly encouraged to start the assignments at least one week before the due date – this will give you time to seek and receive help if you need it. Be sure that you are aware of all due dates posted for each assignment in Canvas.

These Individual Coding Labs and Projects must be done individually. You may not collaborate with other students or use any resources outside of those provided in the course materials. Any use of outside sources like Google (or other search tools), or sites like Stack Overflow, Chegg, Course Hero, etc., ChatGPT, or any other AI application will be considered academic dishonesty (i.e. cheating). **Instances of academic dishonesty will be reported to the Dean's office for disciplinary action**, which may include zeros on assignments, a zero in the course, and suspension or expulsion from the school. See the Academic Integrity section in this syllabus (below) for more details.

These individual Labs and Projects are designed to help you practice the concepts you need to learn in this class. Everything you need to successfully complete each Individual Coding Labs and Projects are provided in the course materials prior to

the actual assignment. These Individual Coding Labs and Projects are designed to be challenging, and you will often struggle to successfully complete them. This struggle is expected and normal. When you are stuck or struggling without progress, your first course of action should be to review the prior course materials in the textbook. If this does not give you the information you need to resume progress on the assignment, then you should engage the provided course help systems that can be found on the Get Help page in Canvas. The best advice is that you should start as early as possible on these Individual Assignments, so that you have time to get any help you may need to successfully complete them before the due date passes. **No late assignments will be accepted for any credit**.

The lowest Individual Coding Lab will be dropped from your final grade calculation – even if that score is a zero. We will not be dropping any of the projects.

Examinations

There will be two exams (Midterm and Final) given during the semester. The exams are comprehensive. Exams may consist of multiple choice, fill-in-the-blank, short answer, programming problems, or any combination thereof. **There is no make-up for any missed exam**. Any use of outside sources like Google (or other search tools), or sites like Stack Overflow, Chegg, Course Hero, etc. will be considered academic dishonesty (i.e. cheating). **Instances of academic dishonesty will be reported to the Dean's office for disciplinary action**, which may include zeros on assignments, a zero in the course, and suspension or expulsion from the school. See the Academic Integrity section in this syllabus (below) for more details.

Calculating Final Letter Grades

Your final letter grade will be based on your final course percentage FCP which is calculated as a weighted sum of your scores on Assignments, and examinations. Your final course percentage will be calculated using this weighting:

Component	Weight
Reading Activities	15%
Quizzes	10%
Individual Labs	15%
Midterm Exam	15%
Final Exam	15%
Projects	15%
Assignments	15%
Total	100%

The following scale will be used to determine your final grade:

Final Grade Percentage

A+	>= 98%
A	>= 90% and < 98%
B+	>= 88% and < 90%
B	>= 80% and < 88%
C+	>= 78% and < 80%
C	>= 70% and < 78%
D	>= 60% and < 70%
E	< 60%

No curving or rounding will be applied to your grades. There will be **no extra credit assignments** given in this course.

The grade of "I" (incomplete) can be given ONLY when a student, who is doing otherwise acceptable work (passing grade), is unable to complete a part of work (e.g., the final exam) because of documented illness or other conditions beyond the

student's control. In the latter case, the student must discuss with the instructor and complete an application form from the department before the part of work is due or as soon as the circumstances are known. Please see ASU grading policies at: http://students.asu.edu/grades-grading-policiesLinks to an external site..

Important Note: The instructor reserves the right to change this grading system as the course progresses and various circumstances develop.

Grade Appeals

Any discrepancy or disagreement in grading must be presented to the instructor **by email within one week** of your receipt of your graded materials; otherwise no grade change will be made. No appeals will be accepted after the one week period for any reason. Your email must include the following: Your full name, Your ASU-Rite ID#, Your CSE 230 course section number, the name of the assignment in question, your justification for challenging the grade you received on this assignment.

Submissions

Individual Assignments will be submitted electronically through the required interactive textbook. Please note that submissions by email will not be accepted for any credit. Instructions for submitting assignments will be provided.

Absence and Makeup Policies

Accommodations will be made for religious observances provided that students notify the instructor at the beginning of the semester concerning those dates. Students who expect to miss class due to officially university-sanctioned activities should inform the instructor early in the semester. Alternative arrangements will generally be made for any examinations and other graded in-class work affected by such absences. For all other absences, no alternative or make-up assignments will be granted.

Requirements for Success in this Course

The instructor assumes that you are mature and responsible adults, that you are enrolled in this course because you wish to learn the material, that you will read any assigned readings before class begins, that you will come to class prepared to discuss the reading and ask questions, that you will complete the assignments to the best of your ability on time, that you will actively participate in class discussions, and that you will ask questions about material you find confusing. The instructor believes that college students must be actively involved in their own learning process, that they cannot just sit and listen to lectures and expect to learn the material, that one of the purposes of college education and the Arizona State University mission is for the student to self-develop skills such as problem solving, independent learning, critical thinking, and effective written and spoken communication. To succeed in this course you must:

- Be prepared for every class, attend every class, and pay attention.
- Read the textbook and any assigned readings prior to class.
- Begin and complete the assignments well before the due date.
- Prepare thoroughly for and complete every exam.
- Do any additional exercises you must to understand the material.
- Study with a partner if you wish or if it helps you.
- Ask questions in class. If you do not feel comfortable asking the question in class, talk with me outside of class.
- If you do not complete an assignment by the deadline, complete it anyway later.
- If you miss points on an assignment or exam determine why your answer was graded incorrect and learn the correct answers.
- Seek help from the instructor, TA, grader, or the tutoring center before you are too far behind on your understanding of the subject.
- Read your email every day; I often send important announcements via email.
- Check the course website and Canvas every day for new announcements, material, and updates.
- Having said all that, I want you to know that I care about all of my students and their education. I want all of you to succeed, to feel you have gained something from the course, to have some fun in the process, and I will do all I reasonably can to assist you in your efforts!

University Policies

All university and college policies concerning withdrawal deadlines, incompletes, audits, and other procedures are in effect for this course. All students are advised to be aware of and to carefully follow these guidelines.

Academic Integrity

Students in this class must adhere to ASU's academic integrity policy, which can be found at https://provost.asu.edu/academic-integrity/policyLinks to an external site.). Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. In addition, all engineering students are expected to adhere to both the ASU Academic Integrity Honor Code and the Fulton Schools of Engineering Honor Code. All academic integrity violations will be reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). The AIO maintains records of all violations and has access to academic integrity violations committed in all other ASU colleges/schools.

Copyright

Course content, including assignment instructions, quiz and exam questions, lectures and slides, are copyrighted materials and students may not share outside the class, upload to online websites not approved by the instructor, sell, or distribute course content or notes taken during the conduct of the course (see ACD 304–06, "Commercial Note Taking Services" and ABOR Policy 5-308 F.14 for more information).

You must refrain from uploading to any website, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement. **Violations of copyright law and ASU' Academic Integrity Policy will be prosecuted**.

Professional and Ethical Behavior

All students in this class are expected to treat others fairly, with respect and courtesy, regardless of such factors as race, religion, sexual orientation, gender, disability, age, or national origin. In this class, you are expected to contribute to the overall campus climate such that others feel welcome, are respected, and are able to develop to their full potential. This will allow each person to contribute to the success of the class as a whole. ASU and the College of Engineering are committed to maintaining a productive, enjoyable and diverse campus environment.

Students are expected to effectively communicate ideas. Inappropriate language (written and oral) does not effectively communicate your ideas to an audience. Inappropriate language includes not only profanity, but also words that are demeaning to a person or group (racially, sexually, ethnically, etc.). You are expected to participate in the various classroom activities, including:

- coming to each class on time and staying until dismissed
- following instructions given by the instructor, including actively working on whatever assignment has been given
- not consuming any food or drink while in the ASU classrooms, and not bringing any open containers of food or drink into the classrooms
- avoiding disruptive side conversations

You are expected to make appropriate use of ASU facilities and property, including:

- leaving a clean work space – tables, floors and chairs; all trash picked up and disposed of; treating walls, furniture and floors properly –putting feet on tables and chairs, etc., not writing upon or disfiguring furniture
- leaving computers as you would furniture – clean and ready to use, without any remaining software, links, screen savers or settings that will offend or impede the efforts of subsequent users

These are consistent with university-wide behavioral expectations described in the various codes of conduct and policies administered through ASU Office of Student Life - Student Judicial AffairsLinks to an external site..

Classroom Behavior

Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services. Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.

The ASU Student Services Manual (SSM 201-10)Links to an external site. permits the instructor to withdraw a student from a course for disruptive behavior with a mark of W (withdrawal) or E (failure). Note that "disruptive behavior" is defined by the instructor, not by the University or the student. Violation of conventional and acceptable classroom behavior will result in the offender being asked to exit the classroom and notification of the offense to the Fulton Schools of Engineering's Dean's Office. A warning may or may not be provided. Any violent or threatening conduct by an ASU student in this class will be reported to the ASU Police Department and the Office of the Dean of Students.

Note that in general, you may sit where you wish. However, the instructor has the right to ask you to sit in a specific seat or move to a different seat at any time during the semester. In the past, I have moved students whom I suspected were cheating during an exam, and I will do so in this course if I believe you are looking at another student's paper or sharing answers during an exam.

Harassment and Sexual Discrimination

Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqsLinks to an external site..
As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services: https://goto.asuonline.asu.edu/success/online-resources.htmlLinks to an external site..

Statement on Accommodations

The Student Accessibility and Inclusive Learning Services CenterLinks to an external site. (480-965-1234; Matthews Center; email: disability-q@asu.edu) is the central location for students requiring accommodation. Any student requiring accommodation must contact and register with the Center before any accommodation requests can be granted by the instructor. If you require accommodation, please contact the Center as soon as possible so the instructor can work with you to ensure your success.

Suitable accommodations will be made for students having disabilities. Students needing accommodations must register with the ASU disabilities resource Center and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in sufficient time for it to be properly arranged.

Waiting for an Absent Instructor

If you are taking this course with scheduled meeting times for lectures or labs, you are obliged to wait at least 15 minutes for class sessions lasting 90 minutes or less, and 30 minutes for class sessions lasting more than 90 minutes. Students may be directed to wait longer by someone from the academic unit if they know the instructor will arrive shortly.

Mask Policy - Until further notified, per ASU policy, **ALL faculty, staff, students and visitors, are required to wear face coverings in classrooms, labs, and offices**.

Note

You are responsible for the contents of this syllabus and the information on the homepage. Make sure you know how to access the home page. Announcements in the class take precedence over printed material. It is very important to check the homepage frequently during the semester.

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