COMP 3410: Computer Organization & Architecture – Fall 2025

Contact Information:

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The best way to contact me is through email – I usually respond within 24 hours.

Office Hours:

It is best to email me to set up an appointment (zoom or in-person) in advance.

Lecture Meeting Times/Locations:

82741 - COMP 3410 – 001 MW 2:20 pm - 3:45 pm Dunn Hall 249

Catalog Description:

COMP 3410 – Basic concepts in assembly language programming, including logic, comparing and branching, interrupts, macros, procedures, arrays, program design, testing, debugging, loading, and linking; combinational, arithmetic and logical circuits ALU; memory circuits, latches, flip-flops, registers; computer structure; fetch-execute cycles, clocks and timing; microprogramming and microarchitecture; data path, timing, sequencing; cache memory organization; RISC architectures.
PREREQUISITE: COMP 2150

Course Website:

You can find the course materials (lecture notes, assignments, codes written during lecture, sample codes, grades, etc.) at the University of Memphis LMS (Canvas) at Dashboard (instructure.com)

Topics Include:

1. Introduction: Computer Abstract/Tech.
2. ARM instruction set architecture and operations.
    a. Operation and Operands of the computer hardware
    b. Number systems and arithmetic for computers.
    c. Parallelism and instructions: synchronization
3. Arithmetic for Computers: Addition, Subtraction, Multiplication, Division, Floating Point
4. Digital logic and processor design.
    a. Logic gates and modular ALU design
    b. Combinational and sequential logic and control
    c. Datapath, Control, Pipelining
    d. Handling of data hazards
    e. Parallelism via Instruction
5. Memory hierarchy and cache organization
    a. Memory technologies
    b. Basics of Caches and performance improvement

6. Parallel Processors
    a. Parallel Program
    b. SISD, MIMD, SIMD, SPMD, and Vector
    c. HW Multithreading
    d. Multicore and Shared Memory Multiprocessors
    e. GPU

Course outcome for COMP3410 (Computer Organization and Design)

(1) Understand the key components within a computer system and organization.
(2) Understand number systems and implement binary arithmetic with overflow handling and floating-point numbers.
(3) Implement assembly language for ARM processor ISA and operations.
(4) understand digital logics, data path, and control using logic gates, combinational and sequential components
(5) Analyze instructions, data path, and control complexity for performance assessment
(6) Analyze the cause of pipeline hazards and implement ways to overcome them.
(7) Understand memory hierarchy and apply the principle of locality in cache design.

Required Text:

zyBook: Computer Organization and Design, ARM Edition by David Patterson and John Hennessy
1. Click any zyBooks assignment link in your learning management system
(Do not go to the zyBooks website and create a new account)
2. Subscribe

Evaluation:

Items	**Points**
Homework Assignments (HW)	**(5 * 40) 200**
zyBooks-Exercises (ZB)	**(13 * 10) 130**
Lab	**(6 *40) = 240**
Quizzes	**(5 * 60) = 300**
Final	**130**
Total	**1000**

Grading Scale: Letter grades will be determined as follows:

A	**B**	**C**	**D**	**F**
100 -> 89	88 -> 76	75 -> 65	64 -> 60	59 -> 0
A+ ≥ 97%	**B+ 85–88%**	**C+ 71–75%**	**D+ 62–64%**	**F ≤ 59%**
A 92–96%	**B 80–84%**	**C 67 –70 %**	**D 60–62%**	
A- 89 –91%	**B- 76–79%**	**C- 65 –67 %**		

Final Exam: based on: Fall 2025 Final Exams - Registrar - The University of Memphis

Assignments:

Throughout the semester, you will have various assignments to reinforce the concepts discussed in the lecture. This class does not have an assigned laboratory section. Instead, you will have exercises (in-class and zyBooks) during lectures to practice your understanding. Therefore, you will not do well in this course unless you work on assignments persistently.

The assignments fall into two categories:

1. In class ZyBooks (ZB) exercises (130 pts) are from the required zyBook textbook.
2. Homework (HW) Assignments (200 pts): HW assignments will allow you to explore the topic more deeply. Please check your course LMS (Canvas) regularly for the posting and due dates details.
3. Lab Assignments (240 pts): Lab assignments are designed to help you bridge theory and practice. They provide hands-on experience, reinforce key concepts from class, and highlight real-world applications of computer architecture.
4. Quiz (300 pts): To ensure you fully understand the content of each chapter, please make sure you review and practice the material carefully. Each new chapter builds on concepts introduced earlier, so having a solid grasp of previous topics will be essential for your success in this course. You must regularly check the course LMS (Canvas) site (https://memphis.instructure.com/) for all the assignment posting and due dates. Unfortunately, there is no makeup for the missing assignments.
5. Final (130) : The final is designed to consolidate everything you have learned throughout the course. It will assess both your theoretical understanding and your ability to apply computer architecture concepts to practical scenarios.

Participation/Attendance: (zyBooks and in-Class exercise)

It is essential to attend the classes regularly. The course will keep building on itself and move pretty quickly. Therefore, it would be best to get a good handle on each concept after discussing it. You will need to submit in-class work regularly, and I will also use that for attendance.

You must bring your laptop with the assigned zyBook textbook for this course. Some in-class exercises may be from the zyBooks chapters. If you miss the lecture and cannot submit the in-class portion, you will receive no marks for the assigned zyBooks exercise. There is absolutely NO extension for the missing (in-class or take-home portion) zyBooks assignments.

Email:

Please check your University of Memphis (@memphis.edu) email regularly (daily), as that is my primary means of communicating with you outside of class.

Late/Makeup Policy:

All assignments (including zyBooks, and in-class exercises) are expected to be completed and turned in on schedule. Each assignment will have specified due dates. Your TA/GA will not accept late assignments except in extreme circumstances. Likewise, you can have makeup quizzes and exams only under extreme circumstances. If circumstances warrant a late work submission or a makeup quiz/exam, get in touch with me with documented proof of your situation no more than one week from the due date.

Plagiarism/Cheating Policy:

An essential part of learning is getting plenty of practice with it yourself. All assignments (unless specifically indicated otherwise) are expected to be done in individual effort. If I determine that you have copied something directly from a book, the Internet, or some other source, you will receive a failing grade on the assignment and (at my discretion) in the course. If I determine that you have copied another student's work, this will happen to both you and the person from whom you copied. The first-time offender will receive a warning through a face-to-face meeting and an email. For the 2nd occurrence, you will be asked to see the department chairperson. The Office of Student Conduct will also receive a copy of this incident for further disciplinary action. Please don't put me in this situation.

Getting Help:

Although I expect you to do your work individually, I encourage you to seek help if you get stuck:

• Contact your course TA\GA.

• Online help: I generally have an open zoom open line on Sat 9:30 to 12noon. Please come prepared with specific questions

Student Disabilities:

If you have a disability that may require assistance or accommodations, or if you have any questions related to any room for testing, note taking, reading, etc., please speak with me as soon as possible. You must officially contact the Student Disability Services Office (678-2880) to request such accommodations/services (http://www.memphis.edu/drs/)

Course Schedule: (subject to change):

Date	Chapters	Quiz	Homework
25 Aug	1.1-1.5		
27 Aug	1.6-1.10		
1 Sep	Labor Day		HW 1 (Chapter 1)
3 Sep	2.1-2.6		
8 Sep	2.7-2.12		
10 Sep	**Lab 1: Chapter 1**		
15 Sep	3.1-3.3		HW2 (Chapter 2)
17 Sep	**Quiz 1 (Chapter 1)**		
22 Sep	**Lab 2: 11.1 – 11.5**		
24 Sep	**Quiz 2 (Chapter 2)**		
29 Sep	3.4-3.6,3.10		
1 Oct	**Lab 3: 11.6 – 11.10**		HW 3 (Chapter 3)
6 Oct	7.1-7.3		
8 Oct	**Quiz 3 (Chapter 3)**		
13 Oct	**Fall Break**		

Date	Chapters	Quiz	Homework
15 Oct	7.5,7.8		
20 Oct	HW4 Discussion		HW 4 (Chapter 7)
22 Oct	**Quiz 4 (Chapter 7)**		
27 Oct	4.1-4.4		
29 Oct	**Lab 4: Single Cycle**		
3 Nov	4.5-4.8		
5 Nov	**Lab 5: Pipeline**		
10 Nov	4.9-4.10		
12 Nov	HW 5 Discussion		HW 5 (Chapter 4)
17 Nov	**Quiz 5 (Chapter 4)**		
19 Nov	5.1-5.4, 6.1,6.3-6.5		
24 Nov	**Lab 6: Caching**		
26 Nov	**Thanksgiving**		
1 Dec	TBD		
3 Dec	Last day of class (TBD)		