

CDA 4205: Computer Architecture

Semester: Summer 2022 | Credit Hours: 3.00

Date: Tuesdays (T) and Thursdays (R) | Time: 5:00 PM – 7:10 PM

Location: CHE 101 | Delivery Method: Face-to-Face (In Classroom)

Instructors' Information

Md Rubel Ahmed

Called by: Rubel

E-mail: mdrubelahmed@usf.edu

Website: <https://rubelahmed57.github.io/>

Office Hours:

- Tuesdays: 1:00 PM – 4:00 PM → ENB II, Room # 249A

Other Meeting Times: By appointments Only (No weekends)

Teaching Assistant's Information

[REDACTED] (Sets quizzes and grades)

E-mail: [REDACTED]

Remote Office Hours:

- Mondays 8:30 AM – 10:30 AM (ONLINE) [LINK](#)

Other Meeting Times: By Appointments Only (No weekends)

[REDACTED] (Exam Grader)

E-mail: [REDACTED]

Office Hours:

- Thursday 3:30 PM – 5.00 PM (ONLINE) [LINK](#)

Other Meeting Times: By Appointments Only (No weekends)

[REDACTED] (Homework Grader)

E-mail: [REDACTED]

Office Hours:

- Fridays 6:30PM – 8:00 PM (ONLINE) [LINK](#)
- Other Meeting Times: By Appointments Only (No weekends)

Welcome Message

The study of Computer Architecture focuses on the interface between hardware and software and emphasis the structure and behavior of the system. As Computer Scientists and Engineers, we need to understand the basics of computer system itself. Because computer architecture is perhaps the most fundamental subject in computer science. Without computers, the field of computer science does not exist. Whatever we do, like surfing the web, sending email, writing a document, is on top of computer architecture, or computers. The subject explores how machines are designed, built, and operate. Knowing what it is inside and how works will help you design,

develop, and implement applications better, faster, cheaper, more efficient, and easier to use because you will be able to make informed decisions instead of estimating and assuming.

Why study Computer Architecture?

- Because you use it every day
- Because you will likely use it for the rest of your life
- Because you are a CS or CE major, studying computer science

Course Description

Course's Description: This course involves the exploration Principles of the design of computer systems, processors, memories, and switches. Consideration of the register transfer representation of a computer, ALU's and their implementation, control units, memory and I/O, and the hardware support of operation systems.

The course involves the following components:

- *Lectures*
 - Topics from the Computer Organization and Design book, RISC-V will be discussed.
 - Discussions on the evolution of computer architecture through different devices will be encouraged. This includes recent news from chip manufacturer companies.
- *Reading*
 - It is expected from students to read the chapters from the book. If a chapter is covered in the class, any material included in that chapter can be on the test.
- *Exams*
 - The purpose of the examination is to evaluate the knowledge obtained and the understanding on the discussed topic within Computer Architecture.

Overall Student Learning Outcome

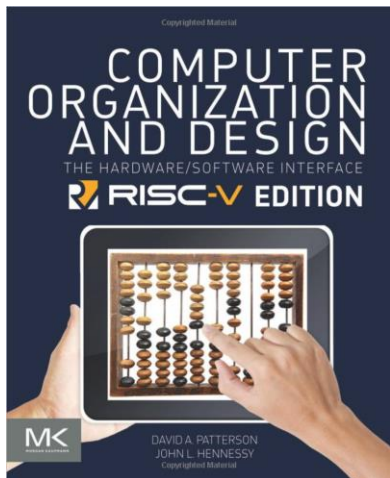
Upon completion of this course, students should have gained a basic understanding of Computer Architecture. The students should also have an understanding on how computer architecture knowledge is applied in chip manufacturing companies.

Specific outcomes of instruction:

- 1) Understand the impact of Moore's Law on computer architectures
- 2) Understand the basic principles of RISC-V
- 3) Evaluate the performance of a computer architecture
- 4) Describe the key principles of instruction set architectures as applicable to different architectures
- 5) Design pipelined architectures
- 6) Evaluate different methods for processor control and data path
- 7) Analyze memory hierarchy, caching, and virtual memory designs, I/O and interface
- 8) Understand new multicore, multiprocessing, cluster, and cloud architectures

Prerequisites (No Exceptions): Computer Logic Design/Lab (CDA 3201/CDA 3201L)

Texts and Materials



Required Textbook:

David A. Patterson and John L. Hennessy, Computer Organization and Design RISC-V Edition: The Hardware Software Interface, 1st Edition, 2018, ISBN-13: 978-0128122754

Tentative List of Topics and Examinations by Week

The lectures of this course will be delivered IN PERSON. The topic list can slightly change at any time.

Week	Tues.	Lecture Topic	Thurs.	Lecture Topic
1	5/17	- Intro to the course. - Syllabus Discussion.	5/19	- Moore’s Law - Impact of technology on arch. Part 1 + 2 + 3
2	5/24	RISC-V Instruction Set Design Part 1 + 2	5/26	RISC-V Instruction Set Design Part 3 + 4
3	5/31	RISC-V Instruction Set Design Part 5 + 6	6/02	Multiplication and Division for Computers Part 1 + 2
	6/07	Multiplication and Division for Computers Part 3 + 4	6/09	Exam 1
4	6/14	Single Cycle Processor Design Part 1 + 2	6/16	Single Cycle Processor Design Part 3 + 4
5	6/21	Pipeline Processor Design Part 1 + 2	6/23	Pipeline Processor Design Part 3 + 4
6	6/28	Exam 2	6/30	Control Unity Design Part 1 + 2

7	7/05	Memory Hierarchy Part 1 + 2	7/07	- Cache memory design - I/O interfaces - Parallel processing, clusters Part 2 Multiprocessing basics Part 2
8	07/12	- Parallel processing, clusters - Multiprocessing basics - Parallel processing, clusters Part 3 Multiprocessing basics Part 3	07/14	Discussion on Final Exam
Exam Week	7/21	Final Comprehensive Exam: 05:05 PM – 7:05 PM		

Grades Evaluation

The grading scheme below gives you more control over your education. You may determine the weight based on the range on the tables for each assessment category as an INTEGER percentage of your semester grade. The total should be 100%. You need to submit your final grading plan via Canvas. There will be a specific assignment for this submission. If you do not submit your grading plan, do not follow the ranges rules, and/or if the one you submit does not add up to 100%, then the grade will be based on the standard percentage shown in Canvas. Note. The weight ranges are not applied in canvas, because the system does not have that feature. The standard percentage is shown instead. At the end of the semester, the submitted weight ranges are calculated in an offline spreadsheet.

Assignments	Weight Ranges	Standard Percentage
Homework	12%-18%	10%
Online Quizzes	N/A	10%
Exam 1 (Thurs, June 09: 5:10 PM – 6:25 PM)	17%-23%	20%
Exam 2 (Tuesday, June 28: 5:10 PM – 6:25 PM)	22%-28%	20%
Comprehensive Final Exam (Thursday, July 21: 05:05 PM – 7:05 PM)	N/A	40%
Total	100%	100%

Grading Evaluation Note: Individual assignments are not curved.

Grade's Curve: In the case any student does not obtain an "A" (at least 93.45) in the course, then the grades are curved to the amount of points the top student needs to obtain the "A" grade.

Final Grades: The grades obtained by the end of the semester are final. The professor can only provide earned grades and not give grades.

Assignment Policy

Homework Assignments: Each homework assignment is due a week from the release date at 11:59:59 PM EST, unless otherwise indicated. The homework grades consist of a maximum of 1 point. There are about 4 to 6 Homework. The homework assignments will be graded based on completion and not correctness. Therefore, there are three grades that can be obtained in a Homework assignment. No partial points will be given, and no key will be shared. Therefore, the student is fully responsible to make sure they have obtained the right answers.

Grade	Description
1	Submission is complete, and all questions were worked thoroughly.
0.5	Submission has incomplete/unworked questions and/or some questions only contain the answers without showing the process.
0	There was no submission, or the submission did not have any questions with step-by-step process to obtain the answers.

Late Homework Submissions: No late homework submissions will be allowed.

Exams: The exams will cover topics from the first day of class until the last lecture prior to the test date. The final exam will be comprehensive covering topics from the first day of class until the last lecture. The homework, lectures, and readings from the book are the best resource to study for the exams. Each test grades consist of a maximum of 100 points. Note. The final exam is not returned to the students.

Other Policies

Attendance: Attendance is not required and will not be graded, but it is highly recommended. USF requires ALL students to be present on the first day of class or they will be automatically dropped. If you are sick or will be absent for a significant period, please contact the professor, and we will work out your best option to succeed in the course. You need to show a note signed by a Medical Doctor. You are responsible for all the material that is covered in the class. If you are absent from a class (whatever may be the reason), you are responsible to learn from your classmates and/or Canvas about what has been covered/announced in the missed classes.

Canvas: All homework submissions, except for the exams will have to be submitted through Canvas. Also, the grades for every homework and exams will be posted on Canvas for your record.

Grades Review: You have up to 7 days from the date the grade is posted to ask for a review of your grade for a specific assignment. After the 7 days, you will not be allowed to ask for a grade review. *Note:* when you ask for a grade review, it is possible to lose points instead of gaining points and vice versa.

- Note. When the student provides reasons for obtaining a better grade in a particular question. The student is not allowed to use links from external sources to justify their reason. In case this happens, the Professor and TA will start a thorough investigation for possible academic dishonesty caused in the assignment. The graders can only evaluate the student's work based on what is covered in class. It is not possible to cover every detail of a computing area in 16 weeks.

Final Grades: The grades obtained by the end of the semester are final. The professor cannot make any changes to grades for any reason requested by the students. A specific student cannot receive special treatment from others unless there is a medical circumstance that was noted during the semester and not after the semester is over.

Course Slides: These will be posted on Canvas.

Extra Credit (Survey/Class Participation): There may be opportunities to gain extra credit points throughout the semester.

Independent Work: You are expected to work independently on all your homework. While general discussion is allowed with other students, detailed solutions to homework problems should not be discussed/exchanged/compared.

Special Accommodations: If you need any special accommodation according to the American Disability Act, please let me know as soon as possible.

Religious Observances: Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) in writing by the second-class meeting.

Grading Scale

Score (Rounded to the Nearest Point)	Grade	GPA Equivalency
Excellent Performance		
94-100	A	4.00
90-93	A-	3.67
Good Performance		
87-89	B+	3.33
84-86	B	3.00
80-83	B-	2.67
Average Performance		
77-79	C+	2.33
74-76	C	2.00
70-73	C-	1.67

Poor Performance		
67-69	D+	1.33
64-66	D	1.00
60-63	D-	0.67
Failure		
0-59	F	0.00

Other Grades	Description
E	Course repeated, not included in GPA
FF	Failure/academic dishonesty
I	Incomplete
IF	Incomplete grade changed to Failure
IU	Incomplete grade changed to Unsatisfactory
M	No grade submitted by instructor
MF	Missing grade changed to Failure
MU	Missing grade changed to Unsatisfactory
N	Audit
S	Satisfactory
U	Unsatisfactory
W	Withdrawal from course without penalty
WC	Withdrawal from extenuating circumstances
Z	Indicates continuing registration

For more information on grades and grading policies, please visit:

Link: <https://www.ugs.usf.edu/catalogs/0102/GRADETC.HTM>

Grades of "Incomplete": The current university policy concerning incomplete grades will be followed in this course. Incomplete grades are given only in situations where unexpected emergencies prevent a student from completing the course and the remaining work can be completed the next semester. Your professor is the final authority on whether you qualify for an incomplete. Incomplete work must be finished by the end of the subsequent semester or the "I" will automatically be recorded as an "F" on your transcript.

Communication Protocol

E-mail Communication:

- Include on the e-mail subject: [CDA 4250] – E-mail Subject ○ If you don't include this subject, expect response delays or no response at all.
 - Keep in mind, professors receive a vast number of e-mails in a daily basis.
 - CC the course's TA to all e-mails.
 - **Any questions about grades of assignments e-mail the TAs**
- I will only answer e-mails on weekdays.
- My e-mail response may be delayed during travel dates.

Announcements

- All announcements (including cancelled classes, if any) regarding the course will be posted on CANVAS.

USF Resources, Regulations & Other Info

USF Core Syllabus Statements: <https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx>

Covid-19 Campus Guideline: <https://www.usf.edu/coronavirus/updates/05-21-21-additional-covid-19-campus-guidance.aspx>

USF Counseling Services: You can make an appointment for counseling at the USF counseling center: <http://www.usf.edu/student-affairs/counseling-center/>

Campus Emergencies: In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to Canvas and email messaging and/or an alternate schedule. It's the responsibility of the student to monitor the Canvas site for each class for course specific communication, and the main USF, College, and department websites, emails, and MoBull messages for important general information.

USF Student Health Services: You can see the different student health services offered by the university: <http://www.usf.edu/student-affairs/student-health-services/services/>

Academic Calendar: You can access the academic calendar for deadlines, holidays and other information on the following link: <http://www.usf.edu/registrar/calendars/index.aspx>

COVID-19 Mitigation Expectations

All students and professors are encouraging to wear face coverings, at all times, during in-person classes. This is especially important while indoors, in crowded outdoor settings, if you have a weakened

immune system or an underlying medical condition.

USF strongly urges all community members to get fully vaccinated. Vaccines are our most reliable means of preventing the spread of COVID-19. The vaccine is free, readily available, and all of USF's faculty, staff, and students are of age to be eligible for the vaccine; therefore, if someone chooses not to be vaccinated, they are assuming significant risk, including isolation and quarantine. Vaccines are also the most reliable way to ensure that students do not face any disruption to their studies or social activities, and faculty and staff do not face disruption to their teaching, research, or university work.

A student who will be absent from an in-person class (due to isolation, quarantine, or other reason) must notify the professor immediately for guidance on academic continuity and student learning.

Academic Integrity

Academic integrity is the foundation of the University of South Florida's commitment to the academic honesty and personal integrity of its university community. Academic integrity is grounded in certain fundamental values, which include honesty, respect, and fairness. Broadly defined, academic honesty is the completion of all academic endeavors and claims of scholarly knowledge as representative of one's own efforts. The process for faculty reporting of academic misconduct, as well as the student's options for appeal, are outlined in detail in [USF Regulation 3.027](#).

Academic Grievance Procedure

The purpose of these procedures is to provide all undergraduate and graduate students taking courses at the University of South Florida an opportunity for objective review of facts and events pertinent to the cause of the academic grievance. An "academic grievance" is a claim that a specific academic decision or action that affects that student's academic record or status has violated published policies and procedures or has been applied to the grievant in a manner different from that used for other students.

Disability Access

Students with disabilities are responsible for registering with Students Accessibility Services (SAS) (SVC 1133) to receive academic accommodations. SAS encourages students to notify instructors of accommodation needs at least five (5) business days prior to needing the accommodation. A letter from SAS must accompany this request. Please visit the [Student Accessibility Services website](#) for more information.

Disruption to Academic Progress

Disruptive students in the academic setting hinder the educational process. Disruption of the academic process ([USF Regulation 3.025](#)) is defined as the act, words, or general conduct of a student in a classroom or other academic environment which in the reasonable estimation of the instructor: (a) directs attention away from the academic matters at hand, such as noisy distractions, persistent, disrespectful or abusive interruption of lecture, exam, academic discussion, or general University operations, or (b) presents a danger to the health, safety, or well-being of self or other persons.

Food and Housing Insecurity

We recognize that student facing financial difficulty in securing a stable place to live and/or in affording sufficient groceries may be at risk of these financial issues affecting their performance in classes. Students with these needs are urged to contact Feed-A-Bull (feedabull@usf.edu or [their website](#)), or Student Outreach and Support (socat@usf.edu or [their website](#)).

Intellectual Freedom and Viewpoint Diversity Act (House Bill 233) **[Preliminary Guidance Document](#)**

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal, educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach enrolled students about a particular subject. Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, private conversations between students in the class or between a student and the faculty member is prohibited. Recordings may not be used as a substitute for class participation and class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the [USF Student Conduct Code](#).

Religious Observances

All students have a right to expect that the University will reasonably accommodate their religious observances, practices, and beliefs ([USF Policy 10-045](#)). The University of South Florida, through its faculty, will make every attempt to schedule required classes and examinations in view of customarily observed religious holidays of those religious groups or communities comprising USF's constituency. Students are expected to attend classes and take examinations as determined by the university. No student shall be compelled to attend class or sit for an examination at a day or time prohibited by his or her religious belief. However, students should review the course requirements and meeting days and times to avoid foreseeable conflicts, as excessive absences in a given term may prevent a student from completing the academic requirements of a specific course. Students are expected to notify their instructors at the beginning of each academic term if they intend to be absent for a class or announced examination, in accordance with this Policy.

Sexual Misconduct / Sexual Harassment

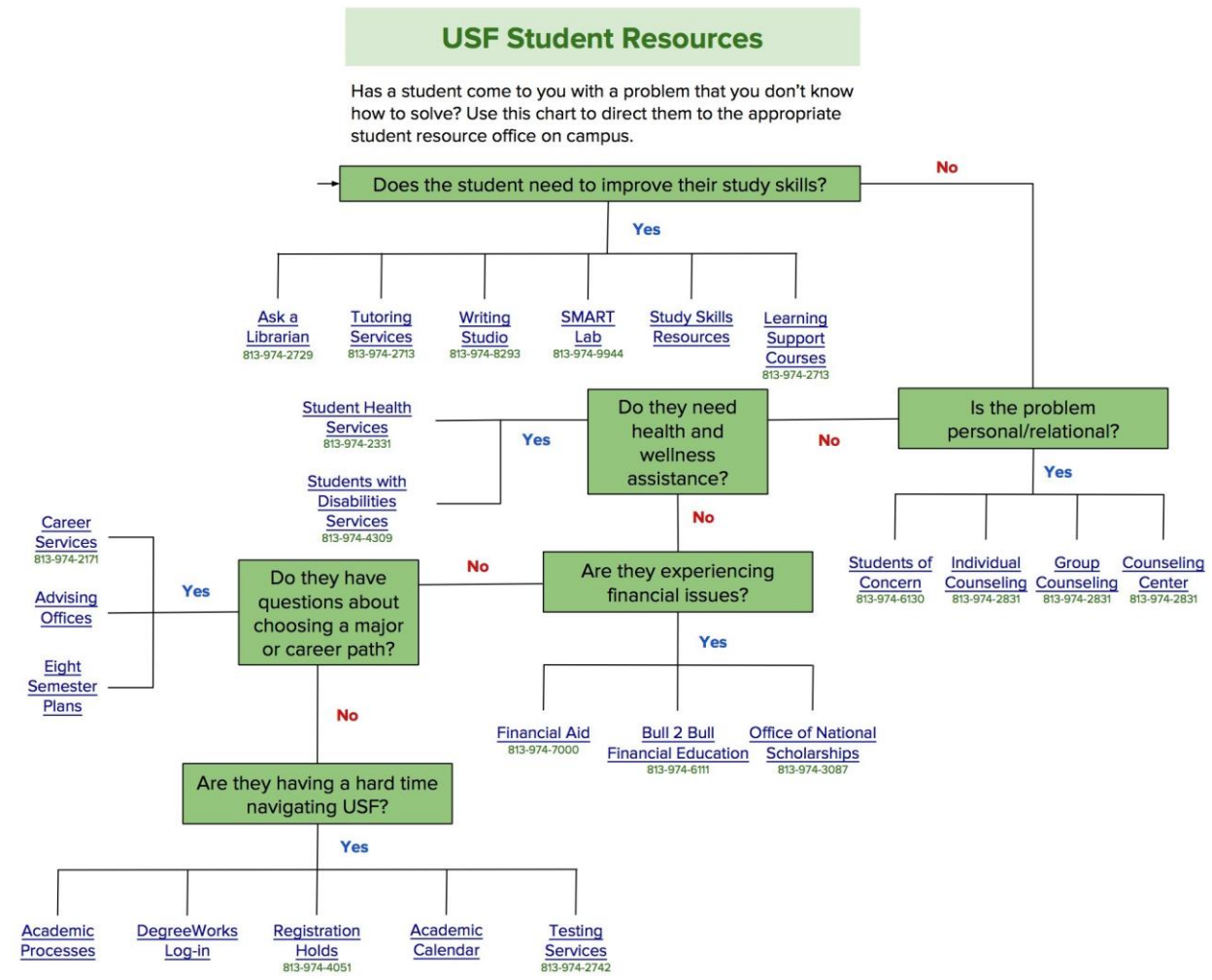
USF is committed to providing an environment free from sex discrimination, including sexual harassment and sexual violence ([USF Policy 0-004](#)). The USF Center for Victim Advocacy is a confidential resource where you can talk about incidents of sexual harassment and gender-based crimes including sexual assault, stalking, and domestic/relationship violence. This confidential resource can help you without having to report your situation to the Title IX Office unless you request that they make a report. Contact the [USF Center for Victim Advocacy](#): 813-974-5757. Please be aware that in compliance with Title IX and under the USF Policy, educators must report incidents of sexual harassment and gender-based crimes including sexual assault, stalking, and domestic/relationship violence. If you disclose any of these situations personally to an educator, he or she is required to report it to the Title IX Office. For more information about Title IX, a full list of resources, or to report incidents of sexual harassment, sexual

violence, relationship violence or stalking visit: usf.edu/title-ix.

Statement of Academic Continuity

In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include, but are not limited to: Canvas, Teams, email messaging, and/or an alternate schedule. It is the responsibility of the student to monitor the Canvas for each class for course-specific communication, and the USF, College, and Department websites, emails, and [ALERTUSF](#) messages for important general information ([USF Policy 6-010](#)).

USF Student Resources Chart



Study Habits Tips

How to Succeed in this Course:

- It is recommended to do regular readings of the covered topics for further understanding.
- For the exams, the PowerPoint lectures are an excellent source to study.
- The topics in this course can be very dense, therefore it is recommended to study the material throughout the semester instead waiting to study just for examination.

The six keys to succeed in a lecture class:

<https://www.youtube.com/watch?v=jTJAczX16k8&feature=youtu.be>

Six strategies for effective learning:

<https://static1.squarespace.com/static/56acc1138a65e2a286012c54/t/57d03e7d59cc6867e7fe9e40/1473265277428/All-B&W-Posters.pdf>