# SYLLABUS

## TCSS 372 – Computer Architecture Autumn Quarter 2020

## Menaka Abraham

**Lecture Info:**We will be using the lecture time to work on focused problems and to answer any questions on Mondays, Wednesdays and Fridays from 11:00 to 12:20 PM  
Zoom link: <https://washington.zoom.us/j/96449850810>   
Sign in to UW Zoom (SSO option, UW NetID required) \*.uw.edu

**Office Hours:**M W F 10:00 to 10:30 (via Zoom, link is only available during office hours or upon request)  
Zoom link: <https://tinyurl.com/menakaofficehours>   
You can request an appointment via email or using Remind app. You can join the Remind app using https://remind.com/join/tcss3 (Links to an external site.) (from your smart device or a browser on your computer)

**Contact Info:**[mmuppa@uw.edu](mailto:mmuppa@uw.edu) or through Canvas Inbox or using Remind app (I forward my messages to my email). *Please don’t email through homework submissions area as I have turned off those notifications to avoid getting an email every time someone submits homework****.***

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| **Course Description** Covers the microarchitecture level of machine design and advanced architecture features for performance enhancement. Topics include computer performance measures, microarchitecture instructions, CPU design (data path, pipelines, control unit, instruction level parallelism), memory hierarchy, cache memory, virtual memory, parallel processing and multicore architectures.   **Prerequisite**: a minimum grade of 2.0 in TCSS 371.  **What You Need to Know Beforehand**  Prior to taking the class, students must be able to:   * Explain the function of basic digital logic circuits * Translate between assembly instructions and machine code * Write short programs in assembly language including function calls * Explain the instruction execution cycle   **Course Objectives**  The objectives of this course are to teach students:   * Assembly programming * CPU implementation, i.e. control signals in single and multi-cycle machines * Pipeline architectures and hazard handling * Memory hierarchy organization * Cache and virtual memory organization * Microprogramming * Parallel architectures   **Student Learning Outcomes**  Upon successful completion of the course, students should be able to:   * Write assembly programs * Explain the hardware implementation of micro architecture instructions * Trace the flow of data and control signals through a data path * Explain the principles of cache and virtual memories * Explain the principles of parallel processing and multicore architectures  Relationship of this course to CSS student learning outcomes:This course supports and assesses the achievement of the following elements of the program objectives:An ability to apply knowledge of computing and mathematics appropriate to the disciplineAn ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needsAn ability to use current techniques, skills, and tools necessary for computing practice. Relationship to UWT student learning goalsInquiry and Critical Thinking: Students will acquire skills and familiarity with modes of inquiry and examination from diverse disciplinary perspectives, enabling them to access, interpret, analyze, quantitatively reason, and synthesize information critically.Communication/Self-Expression: Students will gain experience with oral, written, symbolic and artistic forms of communication and the ability to communicate with diverse audiences. They will also have the opportunity to increase their understanding of communication through collaboration with others to solve problems or advance knowledge. |
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Course Website: Information for this course will be available on the course web site at <http://canvas.uw.edu/>

**Lecture Videos:** Instructor is preparing to create videos online using Zoom. Videos are 20 minutes or less in duration and are paired with online quizzes that can be taken as many times as you want to understand the concepts. Reading the textbook and practicing some of the problems will aid in reinforcing the concepts. When watching a video, consider taking notes as you would in a live lecture. Keep other technological distractions to a minimum while watching the lectures.

**Class Meetings**: We will be spending our class time working on problems and getting questions answered. Please plan to attend these to help with understanding the materials and to engage with your classmates. All problems and answers will be posted on Canvas after the class meeting if you are unable to make it. We will be using breakout rooms for discussions and not all interaction can be recorded as a result.

**Collaboration work and Late submission guidelines**: Give yourself enough time to work on each task (quiz or homework or project or report). ***Other than quizzes, all work can be done individually or in pairs.*** The best way to approach homework is to work on your own and then get together with your partner to validate your answers. ***Only one of the pair members must submit it on canvas***. Verify that your partner submitted, as it's very often that the instructor hears that they forgot. You don’t have to work with the same partner through the quarter. If your schedule doesn’t allow you to work with them, you can work alone at any point or switch partners (if it’s not working out). You may submit up to 24 hours late with 10% deduction. No work will be accepted past the 24-hour deadline. Submitting wrong files or forgetting to submit will also get a 10% deduction. Check your submissions to avoid the deduction. Please make sure that your partner is accountable for their share of the work. *If you really want to help a friend, teach them the concepts, don’t let them get credit for something that they didn’t do.*

**Required Textbook:**   
Patterson, Hennessy: Computer Organization and Design, 5th Edition. Textbook companion site has appendices at <https://booksite.elsevier.com/9780124077263/>

Free e-copy of the textbook is available at[**https://alliance-primo.hosted.exlibrisgroup.com/permalink/f/121n980/CP71287491310001451**](https://alliance-primo.hosted.exlibrisgroup.com/permalink/f/121n980/CP71287491310001451)

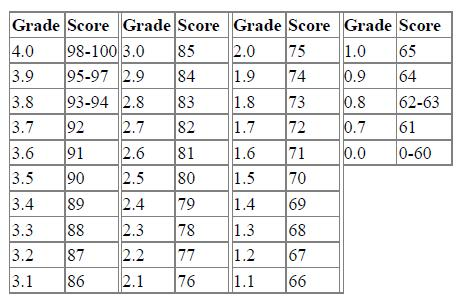
**Grading:**  
There will be multiple forms of assessment in this course

Individual Quizzes (20%) - Online quizzes that can be taken as many times as you want to better understand the concepts from the videos. These are typically due the day before the class meeting time. Quizzes are associated with the lecture videos. You may take them as many times as you want before the deadline. You will not be able to take them past the deadline. Some of the low scores will be dropped at the end of the quarter. The instructor will communicate regarding this towards the later half of the quarter.

Individual or Pair Assignments (30%) - There will be 3 assignments that will cover some of the concepts in this course and some will involve assembly language programming and digital logic circuit design to understand data paths.  
  
Individual or Pair Programming Projects (40%) - There will be 2 programming projects that must be done in Java that build on each other

Individual or Pair Report or Presentation (10%) - You will be assigned a topic related to Computer architecture that needs to be researched. It must be submitted as a report or as a presentation (recorded video or live)

Assignments 30%  
Quizzes 20%  
Projects 40%  
Report or Presentation 10%  
**Total** **100%**



The above grading scale is used to calculate the grade based on the total points (100 points). Points are rounded (Example: 96.5 will be 97 but 96.4 stays at 96). Grading feedback is posted as an email or message in Canvas. *You have up to a week from the time grades are distributed to email the instructor regarding any grade disputes*.

**Grading communication**: The instructor will make sure that grading is done within a week of assignment submission. When sending emails, please use uw email account or canvas inbox so that emails aren’t missed or filtered. Canvas Inbox is the best way to send emails. Please avoid responding to grading comments in the Canvas submission area as the instructor has turned those notifications off to keep the volume of emails down. Please do check your email and Canvas inbox at least once a day so that you don’t miss important communication. Sign up for notifications on Canvas.

## Course Schedule (TENTATIVE)

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| Week | Topic |
| 1 | * Syllabus * Review of Machine Organization (371) Concepts * Control Signals and Data path for LC3 |
| 2 | * Introduction to Computer Architecture * Getting to know MIPS   + Operations   + Data Types   + MIPS Addressing |
| 3 | * Arithmetic for Computers   + MIPS arithmetic   + Parallelism |
| 4 | * The Processor   + Data path   + Pipelining   + Data Hazards   + Control Hazards   + Exceptions   + Parallelism via Instructions |
| 5 & 6 | * The Processor (Cont.) |
| 7 & 8 | * Memory Hierarchy   + Types of memory   + Cache Basics   + Virtual Memory |
| 9 & 10 | * Parallel Processors   + Introduction   + Different types of instruction and data streams   + Multithreading   + Multicores |

# Structure of this Course

Brief Overview

This course will be taught in a slightly different format that you are normally used to. You will come to class meetings after watching the video lectures to work on problems or questions in a collaborative environment. These will be done in smaller breakout rooms to better manage the size of the enrollment. Each module will indicate what videos to watch and quizzes to complete before attending the lecture.

Weekly Format

Each week there will be an assigned “module” to view. Under each module header, you will find required videos, quizzes, readings, discussion board thread, assignments and other materials as I see necessary.

Class Preparation and Participation

It is critical that you complete the assigned videos, quizzes for this course to be ready to solve problems during the class meetings. Higher education is a collaborative experience involving interaction not only with the instructor, but with classmates as well. To get the most out of your education, participation is essential. Be aware that some weeks have more videos/quizzes to cover than others. I will provide a course schedule with the anticipated topics schedule and due dates, but this is subject to revision should I deem it necessary.

Deadlines

I understand emergencies arise, but I expect you to notify me ASAP. Without your input, I am left to assume that you forgot or didn’t want to do the assignment. If you come to me right away with issues such as family emergencies, financial crisis barring you, or other issues- I am more than understanding, so please keep that in mind.

Incomplete Grades

I do not give out incomplete grades unless there are special circumstances (unforeseen and catastrophic) AND you have completed satisfactory (must be passing sufficiently) work up through the completion of Week 8 in the quarter. According to the student conduct code, incomplete grades are solely up to the instructor and require you must be in class, passing the class, up to the point which warrants this. If you disappear from my class and all of your work is not completed, you will receive the grade from the average of those assignments and the total points possible in the course.

Academic Integrity and Collaboration Policy:All assignments must be completed individually or in pairs. However, limited collaboration is permitted as follows.

These actions are acceptable:

* Contacting the instructor for help with, or clarification on, an assignment.
* Posting messages to the class discussion board about parts of the assignment,   
  without posting solutions.
* Discussing the assignment in general terms with other students, without sharing   
   solutions or algorithmic details.

These actions are not acceptable:

* Sharing your assignment solution with another student.
* Sitting with another student and "walking them through" the solution by telling them   
  how to solve the problem in detail.
* Discussing the algorithm(s) for completing an entire assignment or large portions of an assignment in detail with another student.
* Receiving solutions from other students, the Internet, or other sources and submitting it as your own work.

Students found to violate the academic integrity policy will receive zero credit for the assignment and may be reported to the University.

**UW** Tacoma **Policies and Expectations:** For Inclement weather, academic honesty, email policy, disability support services, etc., please visit <http://www.tacoma.uw.edu/teaching-learning-technology/e-syllabus-campus-information-resources-policies-expectations>

**Religious Accommodations:** “Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form](https://registrar.washington.edu/students/religious-accommodations-request/).”

**Technology Requirements** – How to be a successful digital learner: [tacoma.uw.edu](https://www.tacoma.uw.edu/online-learners/successful-online-learner)[/online/success](http://tacoma.uw.edu/online/success)

**Student Conduct in Remote Learning Contexts**: The Student Conduct Code remains in place for all students whether a course is offered in person, online, or remotely. The instructor’s intellectual property rights and the privacy of all course participants must not be violated by students at UW Tacoma. Students may not share course materials with non-class members without explicit written permission from the course instructor. Harassment or bullying of instructors and students, including via electronic media, the internet, social networks, blogs, cell phones, and text messages, will not be tolerated. Students found responsible for such infractions are subject to disciplinary sanctions. Students may not record any part of a class session without the express consent of the instructor, unless approved as a disability accommodation. Individual course instructors may record course sessions but only for use by registered class members for instructional purposes. All recordings will be housed on secure platforms authorized by UW.