

CPTR380 - Computer Architecture
Walla Walla University
Winter 2022

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News: The default communication method between the instructor and students is through email via your standard WWU email address. Please monitor this email address daily for any class updates.

Textbook: Computer Organization and Design, MIPS Version (6th edition);
(required) The Hardware/Software Interface
by Patterson & Hennessy, Morgan Kaufmann publisher, 2021

Prerequisites: CPTR-280 Assembly Language Programming and ENGR-354 Digital Logic

Location: Class meets in KRH-325 at 10am MTWF

Bulletin description: Study of the organization and architecture of computer systems. Students will understand how to measure computer performance, the basics of instruction set design, computer arithmetic including floating point algorithms, classical and modern data path and control architecture, and basic memory design including cache and virtual memory systems. Students will complete their choice of a research project, a VHDL implementation of a custom instruction set, or a software project involving an assembler or compiler for a custom instruction set.

Objectives: - Understand how hardware executes a program
and how software directs hardware to perform needed functions
- Comprehend how hardware and software affect program performance
and how performance can be improved
- Explore the switch from sequential processing to parallel processing
- Investigate hardware and software ways to improve energy efficiency
- Learn how to design a processor

Handouts: Handouts may be given and unless stated otherwise, **you are expected to treat handouts as part of the textbook, i.e. read and understand them.**

Class notes: Material may be presented in lecture that is not in the handouts. Take notes. This material is fair game for tests.

Project: Each student (or team of students) will choose a project whose purpose is to apply what you have been studying this quarter to an in-depth topic in an area of computer architecture. More particulars will be provided mid-way through the quarter as the instructor interacts with the class to find appropriate areas of interest.

Lectures: Lectures attempt to introduce material, give illustrations, provide a forum for questions and answers, and aid learning in general. You are expected to read assigned textbook material prior to coming to class. For detailed technical material like that encountered in a class of this nature, **it is not possible to cover every detail in class**. As a working engineer, you routinely will need to read technical literature (known as life-long learning). Therefore, **it is assumed that you will read and work through the assigned material until you understand it**. When stumped, bring questions to class, email or call the instructor, etc.

Homework: Homework is due at the start of class on the day it is due. Homework turned in later than 5 minutes after class starts will lose 10%. Late work should be avoided, but if submitted will be reduced an additional 10% per day up to one week, then no credit.

Hand written solutions are to be neatly printed on engineering paper using standard engineering format (see problem solution format handout). A ruler and/or a template should be used when drawing diagrams or schematics by hand.

Your work: I expect everything you turn in for grading to be your work and represent your understanding of the material. Homework, or tests that include work that is not your own is cheating and will receive a score of zero. Projects must give credit to the source of any material used from another person or source. At the instructor's discretion, cheating may be rewarded with an F as the **final grade** for the class.

(your work continued) Recognizing that a cooperative study session may enhance understanding, here is my expectation. In general, sharing ideas and strategies verbally will be acceptable in the context of a study group but sharing written work is not. Validating your answers with the group after all members of the group have successfully completed a problem may be acceptable. A rule of thumb is that you need to be responsible for your own work meaning that you understand what you did, you could reproduce it on your own if asked, and you did not copy the solution from someone else or a solution manual.

Grade composition: Homework, quizzes, in-class participation/presentations - 30%
Project- 30%
Midterms(2) - 40%
The instructor reserves the right to shift this distribution to best serve the needs of the class. Scoring generally follows 90,80,70,60% for A,B,C,D but scores may be curved when needed.

Missed exams will receive a score of zero and cannot be made up. (Contact me prior to test time if illness prevents attendance). Attendance at the scheduled final exam time is required.

Help: Out of class help from the instructor is available for those who attend class and thoroughly read the text and handouts (translation: please attend class regularly). If you have questions please come by my office, send email, or call me at the office or home (note the phone numbers at the top of the syllabus). I'm eager to help you but can only do so if you contact me.

Web Site: I have a web page for this class, found at:
people.wallawalla.edu/~larry.aamodt/cptr380
that I use for posting information. Homework assignments will be posted there (newest first) as well as reference material or links to additional reference material. Occasionally an assignment or lab needs clarification after it is handed out. Check the web page to see if additional information or changes have been posted (new notes appear at the top). Some homework will be turned in on paper in class and some may be turned in on D2L. The homework definition will state where to turn it in.

Special needs: Students who have disabilities and desire special accommodation must determine the required accommodation in consultation with Disability Support Services (527-2366) and must also inform the instructor of this class.

Walla Walla University (WWU) is a Seventh Day Adventist institution of higher education

WWU Integrity policy:

On the WWU home page
[academics/academic-administration/academic-policies/academic-integrity-policy/](#)

WWU Emergency information

WWU is committed to having a safe campus. Emergency information is at:
www.wallawalla.edu/campus-life/student-life/campus-security

WWU Disability accommodations

In addition to phone number 527-2366, see:
www.wallawalla.edu/?id=4318

WWU Title IX sex discrimination and sexual misconduct policy

WWU prohibits all forms of sex discrimination and sexual misconduct including, but not limited to, sex-based intimidation and harassment, sexual harassment, domestic violence, dating violence, stalking and sexual violence. If you have been subjected to, or are aware of, an instance of sex discrimination or sexual misconduct, you are highly encouraged to report it to the Title IX coordinator, through the Title IX webpage, or by calling (509) 527-2141. The University has resources to help.

Title IX coordinator email address: cassandre.beccai@wallawalla.edu

Title IX web page:

www.wallawalla.edu/resources/human-resources-payroll/titleix/

Relationship of this class to the WWU core themes

Excellence in Thought

This class helps students develop ability to perform design that requires excellence in thought.

Generosity in Service

Course content does not directly address generosity in service although as an engineering professional there are opportunities to contribute professional service to the community.

Beauty in Expression

There is beauty in carefully crafted documentation that is clear, concise, and complete. Such is required in this class.

Faith in God

A life with inner peace comes through faith in God.

Religious accommodation

Consistent with Washington state policy, WWU reasonably accommodates a student for an absence of up to two days per academic year for reasons of faith or conscience, observance of religious holidays, or participation in an organized activity conducted by a religious denomination, church, or organization. The full policy and request form can be found on the WWU website.