

# COSC 281 System Internals and Assembly Language (Fall 2009)

Instructor: David Owen  
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Time and Place: Monday, Wednesday and Friday 10:00-10:50 AM  
Frey 250 (Wednesday and Friday lectures), Frey 166 (Monday labs)

Office Hours: Monday, Wednesday and Friday 2:00-3:50 PM, Tuesday TBD

Course Website: <https://sakai.messiah.edu/portal/site/200910COSC2811126>  
(Log in to Sakai with your MCSquare user name and password.)

## Description

This course answers the question, “How do computers work?” at the level of the instruction set architecture. That is, we consider the set of simple instructions a processor understands—that processor's assembly language—which a high-level language program is translated into so that the processor can run it. We will study the specific assembly language that runs on a MIPS processor. In addition, we will study computer hardware related topics to understand how assembly language instructions are efficiently carried out by the processor. We will also study software related topics, including the role of system programs, such as compilers, assemblers and linkers, in running a high-level language program.

## Prerequisites

COSC 182 Computer Programming II (or COSC 181 Computer Programming I and my permission)

## Textbook

Patterson, David A. and John L. Hennessy. *Computer Organization and Design: the Hardware / Software Interface*. Fourth edition. Morgan Kaufmann / Elsevier, 2009. ISBN 9780123744937. (New textbook fall 2009.)

## Objectives

Having completed COSC 281, students will be able to:

1. Write programs using the MIPS assembly language, both for the SPIM simulator and as code included within a C program.
2. Do arithmetic by hand, in a way that simulates low-level computer algorithms, on integers and floating point numbers.
3. Program a simple working model illustrating the basic design of a modern (RISC) processor.
4. Understand and discuss principles behind the design of computer systems and assembly languages.

## Requirements and Evaluation

Your grade will be based on the following:

1. A group presentation on the history of computing (10%).
2. 5 MIPS assembly language and 3 C programming assignments (35%).
3. A MIPS processor simulation project (programmed in C) (10%).
4. A test (10%) and a final exam (15%).
5. A participation grade based on attendance, participation and weekly quiz grades (20%). Your participation grade will start at 100%; you will lose 5% for unexcused absences and up to 10% for quizzes (if you score a zero or miss a quiz); I may decrease or increase your participation grade by as much as 5% per class for unsatisfactory or outstanding participation.

Assignments are due at the beginning of class on the day specified. Late assignments will be penalized as follows: 1st day lose 10%, 2nd day lose 25%, 3rd day lose 50%, 4th day no credit. Program documentation and other written assignments should be written using a word processor (Microsoft Word or Open Office), with appropriate title, name, date, etc. and with correct spelling, grammar and punctuation. Your grade will be scaled as follows: A ≥ 93, A- ≥ 90, B+ ≥ 88, B ≥ 83, B- ≥ 80, C+ ≥ 78, C ≥ 73, C- ≥ 70, D+ ≥ 68, D ≥ 63, D- ≥ 60, F < 60.

## Academic Integrity

Students are responsible to read and abide by Messiah College's policy on academic integrity, found on pages 43-45 of the Academic Life section of the student handbook ([www.messiah.edu/offices/student\\_affairs/student\\_handbook/resources/0809/academiclife.pdf](http://www.messiah.edu/offices/student_affairs/student_handbook/resources/0809/academiclife.pdf)). In addition to plagiarism (copying others' work without proper acknowledgment) the college policy also forbids facilitating academic dishonesty (allowing one's work to be copied) and any attempt to gain an unfair advantage over other students (using an outside source, even with proper acknowledgment, that makes the assignment significantly less difficult). Although it's natural and appropriate for computer programmers to work with others and search the Internet for helpful information, be careful to maintain a high level of academic integrity in this course. If you have any concerns about sources of help you've used or would like to use, don't hesitate to talk to me about them.

## Americans with Disabilities Act (ADA) Statement

Messiah College welcomes students with disabilities. If you have a documented disability and wish to discuss academic accommodations for this course, let me know as soon as possible. All disability accommodations must be pre-approved through the Office of Disability Services, x5382.

## Acknowledgments

This syllabus (and the course it describes) is based on contributions from Gene Chase and Gene Rohrbaugh.