CMPSC 210: Principles of Computer Organization
Course Syllabus Fall 2016
Allegheny College

Meeting Times: MWF 11:00-11:50 in Alden 101 (Lab W 2:30-4:20 in Alden 101)
Instructor: Mr. John Wenskovitch
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Office: Virtual
Office Hours: TBD

Course Catalog Description
An introduction to the basic organization and operation of computers, including logical structure, hardware components, machine and assembly language, and computer system performance. Topics include internal representation of information, instruction set architecture, instruction types and addressing techniques, computer arithmetic, memory systems, design and operation of the control unit, input/output devices and interfaces, assembly language and translation techniques, and modern architectural enhancements such as pipelining and multiprocessors. Special emphasis is on systems programming and assignments in a particular assembly language. One laboratory session per week.
Prerequisites: Computer Science 112 officially (CMPSC111 is sufficient)

Required Texts and Materials
- Free Software: MARS (http://courses.missouristate.edu/kenvollmar/mars/)
- Free Software: Logisim (http://ozark.hendrix.edu/~burch/logisim/)
- Course Website: http://www.cs.allegheny.edu/~jwenskovitch/teaching/CMPSC210/
- Slack Channel: <to be filled in>

Learning Objectives
In the Patterson and Hennessy textbook, several questions are listed at the top of page 8; by the end of this course, you should know how to answer them, at least in part:
1. “How are programs written in a high-level language, such as C or Java, translated into the language of the hardware, and how does the hardware execute the resulting program?”
2. “What is the interface between the software and the hardware, and how does software instruct the hardware to perform needed functions?”
3. “What determines the performance of a program, and how can a programmer improve the performance?”
4. “What techniques can be used by hardware designers to improve performance?”
5. “What are the reasons for and the consequences of the recent switch from sequential processing to parallel processing?”
You’ll also learn:
1. how to write, compile, and execute programs in the C programming language;
2. how to write, assemble, and execute programs in the MIPS assembly language (and, if time permits, a little bit about ARM and Intel assembly languages);
3. how different types of data (integer, floating-point, character, Boolean, etc.) are internally represented and manipulated in a computer’s memory;
4. how to assemble basic logic gates into complex logic circuits (such as a processor datapath).

Teaching and Learning Methods
The main mode of learning in this class is following along with the posted course material and reading the accompanying sections in each textbook. Students are responsible for reading assigned portions of the textbook, whether or not the topics are discussed in the lectures. Lectures provide explanation and emphasis for material and examples in the textbook. The instructor will ask questions to stimulate thinking and participation. Students’ comments and questions are highly encouraged. Internet resources will also be used to supplement lectures and discussions.

Grading and Evaluation
Your total grade for the course will be based on the following, weighted appropriately:
- Exam 1 (15%)
- Exam 2 (15%)
- Final Exam (20%)
- Labs and Project (30%)
- Weekly Quizzes (10%)
- Attendance (5%)
- Participation (5%)

A more detailed breakdown of the expectations for grades in the course is as follows:
- **Exams:** Three exams will be given in this class, spaced roughly five weeks apart. The final will be cumulative, as later parts of the course will build on your knowledge from previous weeks. Raw grades for the exams are based on the accuracy and merit of the content. In addition, the grades for the exams will be affected negatively if the quality of language use or the mechanics of the calculations undermine the overall logic and credibility of the content.
- **Labs and Project:** This course contains a weekly laboratory session, where students will investigate some of the topics that are noted in the textbooks and lecture in more detail. This investigation will take the form of solving one or more coding challenges, answering one or more problems prompted by the textbook, and/or a guided walkthrough of a new concept. Some of the labs will be designed to structure together into a larger course project. See the Assignment Submission and Late Policy section of this syllabus for details about the course Late Policy.
- **Weekly Quizzes:** During each weekly lab session, a short online quiz will be administered that serves to test your knowledge of some of the fundamental topics discussed in the lecture materials and in the textbooks.
- **Attendance:** While this is primarily an online course, it is designed to function as close to a standard Allegheny Computer Science course as possible. This means that students are expected to attend lecture and laboratory sessions in the classroom at the stated class time. Attendance will be determined by a short Mastery Quiz at the beginning of each course session, which will only be available during the scheduled class time. See the Attendance Policy section of this syllabus for details about grade reductions as a result of lack of attendance.

- **Participation:** Interaction with the professor and your classmates is important in any Allegheny course, and an online course is no exception. Students will be expected to join discussions on the course Slack channel, attend virtual office hours with the instructor, and providing feedback on the pace and content of the course to the instructor.

**Lecture Structure**
Lectures will consist of two primary formats: standard lectures and Q&A lectures.

- **Standard Lectures:** A standard lecture session will have the following format:
  - A 5-minute Mastery Quiz, with questions reviewing the material from the previous lecture, only graded for Attendance credit.
  - 40 minutes of lecture content, which will include multiple segments of (1) listening to lectures, (2) exploring and enhancing provided code, (3) attempting practice problems, and/or (4)
  - A 5-minute Review Form, to help me understand how you have followed the course material for the current session and if any of the content was unclear.

- **Q&A Lectures:** A Q&A lecture session will have the following format:
  - A 5-minute Mastery Quiz, as above.
  - A dedicated class session to answering questions that have been submitted in advance of the scheduled lecture.

**Lab Session Structure**
A laboratory session will including the following components:

- A ~10-minute Weekly Quiz, with questions reviewing the material from the previous week of lectures, graded for Weekly Quizzes credit.
- A ~100-minute in-depth exploration of some topic(s) from recent course material, due the following week and graded for Lab and Project credit.

Exams will also be given during some lab sessions.

**Attendance Policy**
It is mandatory for all students to attend all of the class and laboratory sessions. If you will not be able to attend a session, then please see the course instructor at least one week in advance to describe your situation. Students who miss more than five unexcused classes, laboratory sessions, or group project meetings will have their final grade in the course reduced by one letter grade. Students who miss more than ten of the aforementioned events will automatically fail the course.
**Assignment Submission and Late Policy**

Assignments for the previous week’s session should be submitted at the beginning of each lab session to your personal BitBucket repository that should be shared with the instructor in advance of the Lab 1 due date. Due dates for each lab will be clearly listed on the lab specification. Failure to hand in the assignment by the deadline will result in a late submission penalty.

Assignments handed in within one week of the deadline will receive automatic grade reductions of 20% (in addition to any points deducted for errors). Assignments will not be accepted more than one week past the deadline, unless you can provide documented extenuating circumstances. Any extenuating circumstances **must be documented** through the Learning Commons, Counseling Center, Dean of Students office, Health Center, or other authoritative source.

If you are unable to attend class for any reason beyond illness or injury, you must make arrangements with me to turn in assignments before class. Exams must be taken at scheduled times. This includes the final exam. Please check the syllabus and with the instructor one week before making any travel plans for the end of the semester or around breaks. Missed exams will receive a grade of zero without a documented illness or emergency.

**Disability Statement**

Students with disabilities who believe they may need accommodations in this class are encouraged to contact Student Disability Services (SDS) at (814) 332-2898. SDS is part of the Learning Commons and is located in Pelletier Library. Please do this as soon as possible to ensure that such accommodations are implemented in a timely fashion.

**Email and Slack**

The instructor will primarily be checking the course Slack channel and his personal email account during the evenings. In general, you can count on me checking these and responding to messages from 7:00 to 10:00 PM, and especially during my scheduled office hours. Any changes to these times will be sent to the course Slack channel. Students who are struggling with the course material or who have question should begin by posting their question (unless a private concern) to the Slack channel, so that the instructor or a fellow student can provide an answer within the bounds of the Honor Code. For more time-constrained concerns, students can approach the course TA or Professor Kapfhammer as a last resort.

**Class Preparation**

In order to minimize confusion and maximize learning, students must invest time to prepare for the class discussions and lectures. During the class periods, the course instructor will often pose demanding questions that could require group discussion, the creation of a program or data set, a vote on a thought-provoking issue, or a group presentation. Only students who have prepared for class by reading the assigned material and reviewing the current assignments will be able to effectively participate in these discussions. More importantly, only prepared students will be able to acquire the knowledge and skills that are needed to be successful in both this course and the field of computer science. In order to help students remain organized and effectively prepare for classes, the course instructor will maintain a class schedule with reading assignments and presentation slides. During the class sessions, students will also be required to download, use, and modify programs and data sets that are made available through the course website.
Honor Code
All students enrolled at Allegheny College are bound by the Honor Code. It is expected that your behavior will reflect that commitment. To this end, we expect that you will adhere to the following Department Policy:

Department of Computer Science Honor Code Policy
It is recognized that an important part of the learning process in any course, and particularly in computer science, derives from thoughtful discussions with teachers, student assistants, and follow students. Such dialogue is encouraged. However, it is necessary to distinguish carefully between the student who discusses the principles underlying a problem with others, and the student who produces assignments that are identical to, or merely variations on, someone else’s work. It will therefore be understood that all assignments submitted to faculty of the Department of Computer Science are to be the original work of the student submitting the assignment, and should be signed in accordance with the provisions of the Honor Code. Appropriate action will be taken when assignments give evidence that they were derived from the work of others.

You are encouraged to periodically review the specifics of the Honor Code as stated in the College Catalogue, The Compass, and elsewhere.

Structure of the Semester
This is a rough outline of the topics covered this semester. A detailed version will be updated at: http://cs.allegheny.edu/~jwenskovitch/teaching/CMPSC210/schedule.html. A shift in the schedule of topics is possible, but the exam dates are firm.

Course Structure
- Weeks 1-2 – Performance
- Weeks 3-4 – Internal Representation of Data
- Weeks 5-8 – MIPS Language
- Weeks 9-11 – Datapath and Control
- Weeks 12-15 – Additional Topics

Exam Dates
- Exam 1 – October 5
- Exam 2 – November 16
- Final Exam – December 20, 9:00 AM