

## General Information

### Course Description

Computer instruction set architecture and implementation. Specific topics include historical perspectives, performance evaluation, computer organization, instruction formats, addressing modes, computer arithmetic, ALU design, floating-point representation, single-cycle and multi-cycle data paths, and processor control. Assembly language programming is used as a means of exploring instruction set architectures. The final project involves the complete design and implementation of a miniscule instruction set processor.

### Prerequisite Topics

The instructor will assume that students are familiar with a number of topics, including combinational and sequential digital logic circuits, 2's complement representation of signed integers, hexadecimal representation, data types, control structures, and event-driven programming. The first homework assignment (Homework 0) is a "Skills Review," which will allow students to assess their own skills with respect to these prerequisite topics.

### Instructors

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### Text

*Computer Organization and Design*, 2<sup>nd</sup> Edition, D. A. Patterson and J. L. Hennessy, Morgan Kaufmann, 1998.

Errata and other extensions to the text are available at <http://www.mkp.com/cod2e.htm>.

### Web Page

The course web page is published at the following URL:

<http://www.rose-hulman.edu/Class/csse/csse232/>.

You should visit the web page regularly. A copy of the schedule is available there along with course materials and other important information.

## **Newsgroup**

The newsgroup for the course is `rhit.csse.csse232`. This is the forum for topics of general interest (i.e. of interest to the entire class). You should read the newsgroup regularly, and the instructors will do the same.

## **In-Class Exercises**

There will be a significant number of in-class exercises. Some of them will require the use of the public domain SPIM software in order to develop students' understanding of assembly language programming. Others will introduce the Xilinx ISE 5.2i software suite, which students will then use for their term projects. The department has obtained licenses for the software. Students, therefore, do not have to purchase the software. As such, students should bring their Microsoft Windows notebook computers to class on a regular basis.

## **Individual Quizzes and Team Quizzes**

There will be unannounced multiple choice quizzes based on the reading assignments. Students will complete the quizzes individually first. They will then answer the same questions in small randomly assigned teams. The individual quiz and the team quiz count equally towards each student's final grade.

## **Homework**

Solutions to the homework assignments will typically be available the day homework is due. Therefore, **late homework will not be accepted**.

Present your solutions to the homework neatly and using good style. Illegible solutions will not receive credit. Your name should appear at the top of each page. You should summarize the given information, restate the problem, state any assumptions that you made, present your solution, and clearly indicate your final answer.

## **Exams**

There will be two exams during the quarter. The topics to be covered will be announced prior to the exams. Missed exams cannot be made up except by prior arrangement or due to circumstances beyond the control of the student (as determined by the instructor). In lieu of a final exam, students will give graded presentations discussing their term projects.

## **Term Project**

The term project is the major focus of the course. The detailed project description and requirements are provided separately, but an overview is included here.

As many students as possible will work in teams of five. The remainder will work in teams of four. As a team, you will design a "miniscule instruction set" computer. You will also use the Xilinx software suite to model your design, test it, debug it, assess its performance, and implement it on a Field Programmable Gate Array (FPGA) microchip. Throughout the project, you will maintain current documentation of your design, as well as an ongoing record of your design process. You will use CVS to manage your collaborative efforts for the programs. Your

final report will be due during final exam week, at which time you will also give a presentation about your project, including a demonstration.

The project is organized into regularly scheduled milestones. At each milestone, you will submit your current design documentation and design process journal. Some of the later milestones represent significantly more effort than some of the earlier milestones, so you should try to work ahead when possible. You will also meet periodically with the instructor to answer questions about your project and discuss your progress.

### Grading

**You must complete the project to the instructor’s satisfaction to pass the course.** Assuming that you do, your grade will be determined by the number of points that you earn. There are 1000 possible points planned, not including the participation grade, as shown in the table below.

Type of Graded Event	Number of Events	Points Per Event	Total Points for Type
Skills Review (HW 0)	1	20	20
Individual Quizzes	4	20	80
Team Quizzes	4	20	80
Homework (HW 1-6)	6	30	180
Exams	2	100	200
Term Project			440
Milestones	6	25	150
Presentation	1	50	50
Final Report	1	200	200
Peer Evaluation	N/A	40	40
Subtotal			1000
Participation	N/A	N/A	100
Total			1100

Note: In order to receive a participation grade other than zero, students must actively and constructively participate in the course, especially in the classroom environment. The instructor does not give these points away easily.

Specifically, your grade will be determined on a “modified contract” basis. The “contract” part means that the number of points that you earn guarantees you a minimum grade, as indicated in the table below. The “modified” part means that the instructor has the prerogative to modify the contract in the students’ favor (for example, if the contract would result in lower grades than the instructor feels are appropriate).

Points Earned	Minimum Grade
900 or more	A
850-899	B+
800-849	B
750-799	C+
700-749	C

650-699	D+
600-649	D

Homework, quizzes, and project milestones will be graded by teaching assistants. Students who are concerned about grades on those events should give the teaching assistants the opportunity to address their concerns before bringing them to the attention of the instructor.

### **Collaboration**

Collaboration is required on certain graded events (team quizzes and the term project), prohibited on others (individual quizzes and exams), and encouraged on the remainder.

Copying is not collaboration. Working out a solution as a group is acceptable collaboration. Each individual is responsible for understanding the entire solution. For homework, this means that once a group solution has been achieved, each collaborator must rework the problem and write up the solution independently.

You must properly credit your collaborators and clearly indicate the extent of the collaboration, except where it is obvious (e.g. team quizzes in which all team members participated roughly equally). Failure to acknowledge collaboration can be considered cheating.