**Computer Science Department**

**[ 91.203 Computer Org. & Assembly Language]**

**[** 4 credits **]**

**Syllabus**

**General Information**

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| **Instructor** | Byung Kim |
| **Office** | OS 231 |
| **Phone** | 978 934 3617 |
| **Class Time** | MWF 11:00-11:50 AM |
| **Class Location** | OS |
| **Office Hours** | MWF 9:00-10:00 AM |
| **Teaching Assistant** |  |

**Required Textbook**

Randal Bryant and David O’Hallaron, “Computer System: A Programmer’s Perspective,” 2nd ed. Prentice-Hall, 2011, Chaps 1-4

**Supplementary Textbook / Materials**

Reference website: csapp.cs.cmu.edu

**Course Description**

Internal operations of computers at the machine level are studied. The organization and operation of a conventional computer are examined by studying principal instruction types, data representation, addressing modes, program control, and I/O. Assembly language programming, including instruction mnemonics, symbolic addresses, assembler directives, system calls, and macros. the usage of text editors, symbolic debuggers, and loaders. The use of pseudocode in guiding structured assembly language programming. In this course, two assembly languages will be used: MIPS and IA32.

**Course Prerequisites**

91.102 Computing II

**Course Category**

Required ~~/ Elective~~

**Course Outcomes:**

**At the completion of this course, students will be able to:**

1. Describe the basic components of a computer. [ABET OUTCOME b,c]
2. Describe how different types of data including floating point numbers are represented in the computer.
3. Write programs in the MIPS assembly language that include the following features: assignment statements, input and output, strings, conditional execution, procedures, arrays, records, and recursion. [ABET OUTCOME i,j,k]
4. Describe how different addressing modes work.
5. Describe how to use pseudocode in guiding structured assembly language programming.
6. Describe and demonstrate how to covert an assembly language program into a corresponding C program.
7. Describe how memory is organized. [ABET OUTCOME c]
8. Describe how peripherals operate and interface with a computer. [ABET OUTCOME c]
9. Demonstrate and discuss how combinational logic components may be used to build an Arithmetic Logic Unit. [ABET OUTCOME a,b]
10. Demonstrate and discuss how combinational and sequential logic components may be used to implement a simple single-cycle computer. [ABET OUTCOME a,b,c]
11. Demonstrate and discuss how combinational and sequential logic components may be used to implement a simple multi-cycle computer.

**Tentative Schedule**

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| **Topic** | **Week** |
| Chap. 1. Introduction | 1 |
| Number systems, integers, Booleans | 2,3 |
| MIPS assembly languages, conditionals | 3,4 |
| Floating point numbers | 5 |
| MIPS hand assembly, examples | 6 |
| IA32 Architecture, instruction set, procedures | 7,8 |
| Logic design, Y86 Architecture | 9 |
| CPU Control design | 10,11 |
| Pipelining | 12 |
| Data dependency | 13 |

**Grading Scheme**

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| --- | --- |
| Quizzes, Homeworks, programming assignments | 30% |
| Two Hour exams | 40 % |
| Final Exam | 30 % |