**King Saud University**

**College of Computer and Information Sciences**

**Department of Computer Engineering**

**CEN 316 – Computer Architecture and Assembly Languages 3(3-0-1)**

**Semester III, Academic Year 2017-2018**

**Required Course: Su-Tu-Th 8:00-11:00**

**Professor Information:**

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Course webpage: http://faculty.ksu.edu.sa/musaed

**Course Description (catalog):**

History of computers. Basic computer organization. Performance evaluation. Data representation. Instruction sets and instruction formats. Machine and Assembly language programming. Assembler function and design. ALUs: Processor organization and design. Pipelining. Micro-programmed CPU. Comparison between CISC and RISC processors. Memory Hierarchy. Cache System design. Storage and I/O.

**Prerequisites:** **Courses** CEN 313

**Topics** Logic Design

**Textbook(s) and/or Other Required Materials:**

# **Primary**: Computer Organization and Design, the hardware/software interface,

By Hennessy and Patterson, 5th Ed.

**Supplementary:** Lecture Slides available at faculty site

**Course Learning Outcomes:** This course requires the student to demonstrate the following:

1. Analyze computer performance and how it is affected by different aspects of hardware and software technology.
2. Explain the different levels of programs and how to write in assembly language.
3. Describe integer and floating-point representations and how arithmetic operations are performed.
4. Evaluate the different techniques related to pipelining (hazards, forwarding, and branch prediction).
5. Analyze different forms of memory organization and their effect on computer performance.
6. Recall concepts of I/O systems.

**Major Topics covered and schedule in weeks:**

* Course Introduction Computer Abstraction and Technology 1
* Instruction set and Assembly Programming 3
* Arithmetic for Computers 2
* The processor: Datapath and Control Simple implementation 2
* The processor: Datapath and Control Pipelining 2
* Memory Hierarchy 2
* Storage and other I/O topics 1
* Review and Evaluation 2

**Tentative Out-of-class Assignments and dates**

HW 1 Performance analysis

HW 2 MIPS assembly language and machine language

HW 3 Arithmetic for Computers

HW 4 Single-cycle and Multi-cycle Machines

HW 5 Pipelining

HW 6 Memory Hierarchy

HW 7 I/O

* All homework assignments are due one week after the assignment date.
* Penalty will be applied to late homework.
* Homework will not be accepted after tutorial session.
* The quizzes may be pop or announced, and may be given at anytime during class-time
* Students are encouraged to discuss homework problems but not copy.
* All exams are closed book.
* The final exam will be comprehensive.

**Assessment Plan for the Course**

Homework 10%

Quizzes and Attendance 10%

Midterm 1 20%

Midterm 2 20%

Final Exam 40%

Total 100%

**Contribution of Course to Meeting Professional Component:**

|  |  |
| --- | --- |
| **Curriculum Discipline** | **Percentage** |
| Mathematics and Basic Science | 30 |
| Engineering Science |  |
| Engineering Design | 70 |
| General Education |  |

**Relationship of Course to Program Outcomes:**

|  |  |  |
| --- | --- | --- |
| **Outcome** | **Program Outcome Description** | **Level of Contribution** |
| (a) | an ability to apply knowledge of mathematics, science, and engineering | √ |
| (b) | an ability to design and conduct experiments, as well as to analyze and interpret data |  |
| (c) | an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability | √ |
| (d) | an ability to function on multidisciplinary teams |  |
| (e) | an ability to identify, formulate, and solve engineering problems | √ |
| (f) | an understanding of professional and ethical responsibility |  |
| (g) | an ability to communicate effectively |  |
| (h) | the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context | √ |
| (i) | a recognition of the need for, and an ability to engage in life-long learning |  |
| (j) | a knowledge of contemporary issues |  |
| (k) | an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. |  |