California University of Pennsylvania
University Course Syllabus
Approved: Spring 2012

Department of Mathematics, Computer Science, and Information Systems

A. Protocol

Course Name: Computer Architecture
Course Number: CSC378
Credits: 3
Prerequisites: Co-Requisite: CSC 323 or CET/EET 270

Maximum Class Size (face-to-face): 35
Maximum Class Size (online): N.A.

B. Objectives of the Course:
Upon completion of this course the student will be able to:

1) Identify and discuss instruction formats.
2) Discuss relationships among assembly language mneumonics and machine language instructions.
3) Perform complex operations with a fundamental instruction set.
4) Identify and discuss internal components of a CPU.
5) Discuss the operation of ripple addition.
6) Implement and discuss the operation of CLA addition.
7) Discuss the implementation of logic operations.
8) Discuss the design and operation of ALUs.
9) Write the description of assembly language instructions using RTL grammar.
10) Perform the translation of RTL descriptions into microsequences for a CPU structure.
11) Discuss the fetch execute sequence.
12) Describe the function of CPU registers, program counters, program status word and stack pointers.
13) Discuss the incorporation of user registers into a CPU structure.
14) Discuss various techniques for the implementation of subroutine processing.
15) Discuss various addressing modes.
16) Write and discuss the microprogramming and operation of a control unit.
17) Research, discuss, and report on variations of a generic CPU into specialized CPU structures.
18) Perform data transfer rate calculations.

C. Catalog Description:
This course provides the student with an in-depth study of the organization of the central processing unit, arithmetic logic unit, control unit, instruction formats, and addressing schemes of digital computers. Extensive emphasis is placed on the translation of assembly language instructions into their microsequence operations within the control unit and the interconnection and control of registers, arithmetic logic units, memory units, and busses which form the central processing unit and the digital computer. Co-Requisite: CSC 323 Assembly Language Programming or CET/EET 270. Three credits.

D. Outline of the Course:
1) Hypothetical Computer
    a. Introduction to a computer with the IPO cycle
    b. Assembly language instruction set and machine language representation
        i. Data transfer group
        ii. Arithmetic and logic group
        iii. Control group
    c. Instruction formats

d. Programming with a minimal instruction set
e. Fetch execute cycle

2) Binary Arithmetic
   a. Addition, subtraction and 2's complement
   b. Full adder combinational network
   c. Carry look ahead addition
      i. Carry look ahead adder
      ii. Carry look ahead generator
   d. Arithmetic logic unit
   e. Logic unit
   f. Shifter unit
   g. Multiplication
      i. Hardware
      ii. Software

3) CPU and Memory
   a. Register transfer language
   b. Microsequence signals
   c. Memory organization
   d. CPU structure
   e. Index registers and related instructions
   f. Subroutine implementation
   g. Addressing mode

4) Control Unit
   a. Microsequence implementation and control signals
   b. Translation of machine instructions to microsequences
   c. Control unit
      i. Discrete sequential machine
      ii. One-hot assignment sequencer
      iii. ROM based sequential machine
   d. Microprogramming of the control unit

5) Extending Generic CPU Concepts to Specialty Structures

6) Date Transfer Rates
   a. Input/output control
   b. Data transfer rate calculations

E. Teaching Methodology:

1) Traditional Classroom Methodology:
This course will be taught using the lecture/discussion method and cooperative group method during appropriate sections of the course.

2) Online Methodology:
This course will not be taught online.

F. Text:
Clements Principles of Computer Hardware (4th Edition) ISBN 0199273138

G. Assessment Activities:

1) Traditional Classroom Assessment
The final grade will be determined as a percentage from the following evaluation methods with varying weights at the discretion of the instructor:

   a. Examinations
   b. Quizzes
   c. Assignments
   d. Programs

e. Attendance
f. Performance

2) Online Assessment
No online assessments will be given.

H. Accommodations for Students with Disabilities:

Accommodations for Students with Disabilities

Students reserve the right to decide when to self-identify and when to request accommodations. Students requesting approval for reasonable accommodations should contact the Office for Students with Disabilities (OSD). Students are expected to adhere to OSD procedures for self-identifying, providing documentation and requesting accommodations in a timely manner.
Students will present the OSD Accommodation Approval Notice to faculty when requesting accommodations that involve the faculty.

Contact Information:

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