El Paso Community College
Syllabus
Part II
Official Course Description

SUBJECT AREA	**Computer Science**
COURSE RUBRIC AND NUMBER	**COSC 2425**
COURSE TITLE	**Computer Organization and Machine Language**
COURSE CREDIT HOURS	**4 4 : 1** **Credits Lec Lab**

I. Catalog Description

Introduces the organization of computer systems using assembly language. Includes topics on basic concepts of computer architecture and organization, memory hierarchy, data types, computer arithmetic, control structures, interrupt handling, instruction sets, performance metrics, and the mechanics of testing and debugging computer systems. Introduces systems and device interfacing. It is highly recommended that students take COSC 1436, COSC 1437 before enrolling in COSC 2425. **Prerequisite: READ 0309 or INRW 0311 or ESOL 0340 (can be taken concurrently) or by placement exam or ENGL 1301 with a "C" or better or ENGL 1302 with a "C" or better. (4:1).**

II. Course Objectives

A. Unit I. Computer Architecture Abstractions

1. Trace the execution of Java programs from the object-oriented language level down to the Nand level.
2. Explain the abstraction/implementation paradigm and its role in systems design.
3. Identify the Hardware Description Language (HDL) used in the course.
4. Design a set of elementary logic gates from primitive Nand gates.
5. Implement elementary logic gates in HDL.

B. Unit II. Combinatorial Logic

1. Use the logic gates built in Unit I to design and implement a family of binary adders.
2. Combine the binary adders to construct a simple ALU (Arithmetic-Logic Unit).

C. Unit III. Sequential Logic

1. Design and implement a memory hierarchy using the logic gates built in Unit I.

D. Unit IV. Machine Language

1. Explain the concept of an instruction set, in both binary and assembly (symbolic) versions.
2. Write low-level assembly programs using the instruction set and run them on a supplied CPU emulator.

E. Unit V. Computer Architecture

1. Integrate the chip-sets built in Units I-III into a computer platform capable of running programs written in the machine language presented in Unit IV.

F. Unit VI. Assembler

1. Identify the basic language translation techniques: parsing, symbol table, macro-assembly.
2. Build an assembler for the assembly language presented in Unit IV.

F. Unit VII. Virtual Machine I.

1. Describe the role of virtual machines in modern software architectures like Java and .NET.
2. Analyze a typical virtual machine language, focusing on stack-based arithmetic and logical and memory access operations.

3. Implement the first part of a virtual machine translator that translates from the virtual machine language into the assembly language presented in Unit IV.

F. **Unit VIII. Virtual Machine II.**

1. Extend the discussion of virtual machine abstraction and implementation.
2. Identify stack-based flow-of-control and subroutine call-and-return techniques
3. Extend the virtual machine translator from Unit VII into a complete virtual machine implementation that serves as the back-end component of the compiler built later in the course.

G. **Unit IX. High Level Language**

1. Utilize *Jack*, a simple, high-level, object-based language with a Java-like syntax.
2. Explore various trade-offs related to language design and implementation.
3. Use Jack to write a simple interactive game and run it on the computer built in Units I-V.

III. THECB Learning Outcomes (ACGM)

Upon successful completion of this course, students will:

1. Explain contemporary computer system organization.
2. Describe data representation in digital computers.
3. Explain the concepts of memory hierarchy, interrupt processing, and input/output mechanisms.
4. Measure the performance of a computer system.
5. Design and develop assembly language applications.
6. Explain the interfaces between software and hardware components.
7. Explain the design of instruction set architectures.
8. Develop a single-cycle processor.
9. Explain the concept of virtual memory and how it is realized in hardware and software.
10. Explain the concepts of operating system virtualization.

IV. Evaluation

A. Preassessment.

Students must have taken and completed READ 0309, “Effective College Reading,” prior to taking this course.

B. Postassessment

1. There will be three (3) written examinations.
2. There will be nine (9) projects and that will be averaged on a 100-point scale.
3. Lab assignments will be assigned at the instructor’s discretion and will be averaged on a 100- point scale.

C. Remediation

The instructor may provide the students with means of improving a grade. The instructor will determine the timing, form, and method of remediation.

D. Final Grade

The final grade report will be based on the percentage of the total points earned.

V. Disability Statement (Americans with Disabilities Act [ADA])

EPCC offers a variety of services to persons with documented sensory, mental, physical, or temporary disabling conditions to promote success in classes. If you have a disability and believe you may need services, you are encouraged to contact the Center for Students with Disabilities to discuss your needs with a counselor. All discussions and documentation are kept confidential. Offices located: VV Rm C-112 (831-2426); TM Rm 1400 (831-5808); RG Rm B-201 (831-4198); NWC Rm M-54 (831-8815); and MDP Rm A-125 (831-7024)

VI. 6 Drop Rule

Students who began attending Texas public institutions of higher education for the first time during the Fall 2007 semester or later are subject to a 6-Drop limit for all undergraduate classes. Developmental, ESL, Dual Credit and Early College High School classes are exempt from this rule. All students should consult with their instructor before dropping a class. Academic assistance is available. Students are encouraged to see Counseling Services if dropping because exemptions may apply. Refer to the EPCC catalog and website for additional information.

.Revised by Discipline: Fall 2012 (next revision in 3 years)