ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Faculty of Electrical and Computer Engineering
COURSE SYLLABUS
Computer Architecture and Organization

1. CODE AND NUMBER OF CREDITS

CODE	FIEC03319	
NUMBER OF CREDITS: 4	**Theoretical: 4**	**Practical: 0**

2. COURSE DESCRIPTION

In this course, the student will understand the technology and the fundamental principals related with the organization and architecture of the computer systems. They will also understand the advantages and disadvantages of processors of CISC and RISC technology. In four programming projects using assembly language, the student will experiment with the use of an Instruction Set Architecture (ISA) for a typical commercial processor. They will also be able to evaluate the performance of a program and the way to optimize.

3. PRE-REQUISITES AND CO-REQUISITES

PRE-REQUISITES	FIEC00299 DIGITAL SYSTEMS I
CO-REQUISITES	

4. CORE TEXT AND OTHER REQUIRED REFERENCES FOR THE TEACHING OF THE COURSE

CORE TEXT	1. . John L. Hennessy, David A. Patterson. Computer Organization and Design, Fourth Edition: The Hardware/Software Interface (The Morgan Kaufmann Series in Computer Architecture and Design), Fourth Edition. ISBN-10: 0123747503
REFERENCES	1. John L. Hennessy, David A. Patterson. Computer Architecture, Fifth Edition: A Quantitative Approach (The Morgan Kaufmann Series in Computer Architecture and Design). 2011. ISBN-10: 012383872X

5. COURSE LEARNING OUTCOMES

At the end of the course, the student will be able to:

1. Program more effectively through the application of concepts about Computer Organization and Architecture
2. Evaluate the different technologies used for building computers and the interrelations of those technologies with the components.
3. Describe the steps through which a program in high language gets transformed to a set of machine language instructions
4. Explain the functions of a computer, by discovering the interaction among its memory systems, buses and Input/Output devices and by evaluating the different design techniques available.

6. COURSE PROGRAM

I. Introduction (2 sessions – 4)
  - Parts and functions of a computer
  - Performance
  - Numeric Representation
  - Basics of C language
II. Instruction Set Architectures (6 sessions – 12 hours)
  - Operations and Operands
  - Intruction Representation
  - Addressing
  - MIPS
III. Arithmetic for Computers (2 sessions – 4 hours)
  - Addition, Sustraction, Multiplication and Division

- Floating Point Operations
- CISC vs RISC

IV. CPU (4 sessions – 8 hours)
- Datapath
- Simple implementation scheme
- Pipeline Implementation scheme
- Control
- Hazards

V. Memory (4 sessions – 8 hours)
- Cache Memory
- Measuring Cache Memory
- Virtual Memory
- Memory Hierarchy
- Virtual Machines

VI. Storage and Sytems Buses (6 sessions and 12 hours)
- Dependency, Comfiability and Relaiability
- Disc Storage
- Flash Storage
- Conectivity among Processors, Memory and I/O Devices
- I/O Interfaces with Processor, Memory and Operating System
- Metrics of Performance
- I/O System Design
- Parallelism

VII. Multicores, Multiprocessors and Clusters (4 sessions – 8 hours)
- Shared Memory Multiprocessors
- Clusters
- Multithreading Hardware
- SISD, MIMD, SIMD, SPMD and Vectors
- Direct Memory Access (DMA)
- Review

7. WORKLOAD: THEORY/PRACTICE

The subject is taught two sessions per week. Each session is 2 hours, giving a total of 4 hours per week.

8. CONTRIBUTION OF THE COURSE TO THE EDUCATION OF THE STUDENT

The knowledge and skills learned in this course are strongly related to the development of operating systems and development of efficient programs, not to mention it is very important for the construction of compilers. In the professional field, students can easily identify and establish the best features of a computer, as well as evaluate and distinguish the different technologies in the design of computers. This course allows a better understanding of how computational systems work to optimize the use of their resources and to give an effective support to computer systems.

BASIC TRAINING	PROFESSIONAL TRAINING	SOCIAL SKILLS DEVELOPMENT
	X	

9. THE RELATIONSHIP BETWEEN THE LEARNING OUTCOMES OF THE COURSE AND THE LEARNING OUTCOMES OF THE DEGREE PROGRAM

LEARNING OUTCOMES OF THE DEGREE PROGRAM*	CONTRIBUTION (High, Medium, Low)	LEARNING OUTCOMES OF THE COURSE**	THE STUDENT MUST:
a) An ability to apply knowledge of computing and mathematics appropriate to the discipline	HIGH	2	To calculate the performance of a solution, considering the organization and computer architecture
b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution			
c) An ability to design,			

implement, and evaluate a computer-based system, process, component, or program to meet desired needs			
d) An ability to function effectively on teams to accomplish a common goal	HIGH	3, 4	To work in a group for submitting a Project on time.
e) An understanding of professional, ethical, legal, security and social issues and responsibilities			
f) An ability to communicate effectively with a range of audiences			
g) An ability to analyze the local and global impact of computing on individuals, organizations, and society			
h) Recognition of the need for and an ability to engage in continuing professional development	HIGH	1	Learn at his/her own pace and by himself new tools for editing and simulation of programs written in assembly language of some processor.
i) An ability to use current techniques, skills, and tools necessary for computing practice.	MEDIUM	1	Use an editing and simulation tool for develop a assembly program for MIPS
j) Ability to lead, manage and undertake projects.			

10. EVALUATION IN THE COURSE

Evaluation activities	
Exams	X
Tests	
Homework/tasks	X
Projects	X
Laboratory/Experiments	
Class participation	X
Visits	
Other	

11. PERSON RESPONSIBLE FOR THE CREATION OF THE SYLLABUS AND THE DATE OF ITS CREATION

Created by	Sixto García Aguilar, PhD
Date	May 12, 2013

12. APPROVAL

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Sra. Leonor Caicedo G.	NAME: Ing. Marcos Mendoza V.
SIGNATURE:	SIGNATURE: ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Date of approval by the Directive Council: 2013-334 2013-08-12	Ing. Marcos Mendoza V. DIRECTOR DE LA SECRETARIA TÉCNICA ACADÉMICA

13. VALIDITY OF THE SYLLABUS

RESOLUTION OF THE POLYTECHNIC BOARD:	13-10-269
DATE:	2013-10-17