NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF SCIENCES
ENGINEERING PHYSICS PROGRAM

CC212 – COMPUTER ARCHITECTURE

I. GENERAL INFORMATION

CODE	**:**	CC212 Computer Architecture
SEMESTER	**:**	8-10
CREDITS	**:**	4
HOURS PER WEEK	**:**	6 (Theory – Practice)
PREREQUISITES	**:**	IF401 Digital Electronics
CONDITION	**:**	Elective

II. COURSE DESCRIPTION

The aim of this course is to provide students with criteria for evaluation and specification, as well as, design techniques and the making of certain computer architecture. It encourages group and individual work for the execution of the design of a user-programmable digital system, with all its execution and checking presentations.

III. COURSE OUTCOMES

1. Specify and describe Digital Systems textually, interpret and implement them physically, using design algorithmic and structured methods and Digital Systems Synthesis.
2. Design, convert and specify programmable digital systems using programmable devices.
3. Organize, design and implement the basic computer architecture, checking its operation.
4. Learn storage systems technology, use and design and management.
5. Design, specify and assess digital systems testable during their correct performance according to original specifications when making their massive production identifying the defective ones.

IV. LEARNING UNITS

1. STRUCTURED LOGIC AND HARDWARE DESCRIPTION LANGUAGE / 10 HOURS

FSM review. Structured logic, Synthesis techniques, SSI, MSI, VLSI, PLD technologies. Characteristic pros and cons and examples, problems and their possible solutions. Hardware description language, descriptive techniques using LTR, VHDL.

2. ALGORITHMIC STATE MACHINE / 10 HOURS

Algorithmic State Machine (ASM), concepts, boxes, flowchart. Processing Unit and Control Unit, examples. Case studies applied to ASM, problem-based learning, solution methodology for several cases. Group cases analysis.

3. COMPUTER ARCHITECTURE: HARDWARE ASPECTS / 5 HOURS

The computer, architecture, organization. Von Neumann, Harvard, Processing Unit and Control Unit, Instruction, formats. Case studies.

4. COMPUTER ARCHITECTURE: SOFTWARE ASPECTS / 10 HOURS

Operating system, translators. Program and Assembly language, Examples, Addressing modes, direct, relative, indexed, etc. Object Program, examples.

5. STORAGE SYSTEMS AND ITS MANAGEMENT / 10 HOURS

Dynamic and static memories: their architectures, building, operation techniques and uses according to the technology. Memory Bank Examples. Memory systems management. Interfaces. Group problem solving.

6. INTERFACES AND CONTROLLERS / 10 HOURS
Interfaces and/or controllers description, Computer types, architectures, uses and functions. Practical examples.

7. COMPUTER PERFORMANCE / 05 HOURS
Measures of computer performance, MIPS, cost per MFLOPS.

8. ADVANCED ARCHITECTURES / 05 HOURS
Computer advances architectures, examples.

9. TESTABLE SYSTEMS/ 10 HOURS
Testable systems: concepts, combinational circuit fault modelling, Types: Exhaustive, stuck-at, Path sensitizing, D algorithm, Group case studies, special fault modelling for sequential circuits. Timing, tracking. Application examples.

V. LABORATORY EXPERIENCES

Lab 1: Use of ALTERA's EDA software to control and simulate a counter.
Lab 2: VHDL design of a circuit for the control of a push-button.
Lab 3: VHDL controller design for a stepper motor.
Lab 4: VHDL controller design for a LCD module.
Lab 5: VHDL controller design for a dot-matrix hex keyboard.
Lab 6: Course final project.

VI. METHODOLOGY

The course is carried out through three didactics methods:

a. Theory sessions: carried out through instructor's lectures complying with the established schedule. Student active participation is encouraged in every session through questions, problem-solving, discussion of cases, bibliographic information search on the internet.
b. Practice sessions: carried out with the aim of develop skills and flairs described in the outcomes. The instructor proposes exercises and cases to be solved using the knowledge acquired during theory sessions.
c. Lab sessions: carried out using the proper software which helps the student visualize the most important aspects of the analysis of a continuous-time control system. This semester ALTERA's QUARTUS II software will be used. Cases to be solved will be given in advance so that the reports can include research, updating and an in-depth knowledge of it.

VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

PF={EF+EP+{[(P1+P2+P3+P4)/3]+[L1+L2+L3+L4+L5+L6+(PROY*4)/10]}/2}/3

EP: Midterm Exam EF: Final Exam
P : Quizzes L: Lab Work
PROY: Lab projects

VIII. BIBLIOGRAPHY

1. **MICZO, A.**
   Digital Logic Testing and Simulation 2nd edition
   Ed. J WW, 2003
2. **PATTERSON, HENNESSY**
   Computer Structure and Design. Interface and Circuitry (Spanish)
   Reverte Editions, 2000