ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Faculty of Electrical and Computer Engineering
COURSE SYLLABUS
Digital Systems II

1. CODE AND NUMBER OF CREDITS

CODE	FIEC00745	
NUMBER OF CREDITS: 4	**Theoretical:** 4	**Practical:** 0

2. COURSE DESCRIPTION

The Digital Systems II course provides an integration of knowledge on Digital Systems Design of small and medium scale of integration, using both traditional and modern methods of design as methods based on CAD tools and hardware description language VHDL.
The knowledge of these techniques is essential in the current technological environment, where digital electronics has an important role.
At the end of the course students will be prepared to apply their knowledge in practice, in the course of Digital Systems Laboratory.

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	Brown S. & Z. Vranesic, Fundamentals of Digital Logic with VHDL Design, Second Edition, 2006, McGraw Hill.
REFERENCES	1. Wakerley J., Digital Design, Principles and Practices, 2001, McGraw Hill. 2. Perez S. & Soto E., Digital System Design with VHDL, 2002, Thomson. 3. Villar E. and others, VHDL standard electronic design language, 1998, McGraw Hill. 4. Mandado E. and others, Programmable Logic Devices and Applications, 2002, Thomson. 5. W. Fletcher, An Engineering Approach to Digital Design, 1980, Prentice Hall. 6. R. Tocci, Digital Systems, Principles and Applications, 2001, Prentice Hall. 7. Hernandez A., Introduction to Digital Design combinational and sequential circuits, CIME, 2002, ISPJAE. 8. Blanco N. and Charles J. Electronics Books for Teaching Logic Circuits Version 2.1 2003 CD.

5. COURSE LEARNING OUTCOMES

After completing the course the student will be able to:
1) To design and implement synchronous sequential circuits.
2) Use MSI and LSI integrated circuits to implement synchronous sequential circuits.
3) Using hardware description language (VHDL) for to create combinatorial and sequential digital circuits.
4) Describe, design and simulate digital systems using CAD tools and hardware description language (VHDL).

6. COURSE PROGRAM

I. INTUITIVE DESIGN OF DIGITAL SYSTEMS. (3 sessions - 6 hours).
- Examples of Functional Partition intuitive design for Digital Systems

II. SYNCHRONOUS SEQUENTIAL CIRCUITS (10 sessions - 20 hours).
- Introduction. General block diagram.
- MSS models Moore and Mealy.
- State diagram.
- General procedure for designing a traditional method MSS with state diagram.

- Assigning status codes.
- Design a MSS using CAD tools and VHDL code.
- Alternative style of VHDL code. Assigning status codes in VHDL.
- Designing MSS with a one flip - flop per state (one-hot encoding) method.
- Design a MSS with Mealy model.
- Minimization of states.
- Problems on synchronism.
- Design of counters.
- MSS design samples. MSS analysis. ROM memory usage in designing of MSS.
- ASM diagram. Designing a MSS with ASM diagram.

III. RAM MEMORY. (1 session - two hours).

- Introduction.
- Classification of RAMs.
- Structure and characteristics of static RAM.
- Commercial SRAM. Synchronous SRAM.
- Structure and characteristics of dynamic RAM.
- Commercial DRAM. Synchronous DRAM.

IV. FORMAL DESIGN OF DIGITAL SYSTEMS. (10 sessions - 20 hours).

- Introduction.
- General block diagram.
- Circuit controller and data processor.
- Functional partition.
- General procedure of designing a digital system.
- General structure of the VHDL code in the design of a digital system.
- Examples of Digital Systems Design.

V. ASYNCHRONOUS SEQUENTIAL CIRCUITS. (4 sessions - 8 hours).

- Introduction.
- General model of the sequential circuit.
- Analysis of behavior of an MSA in fundamental mode.
- Design of a MSA.
- Conditions for non-critical and critical hazards.
- Hazards. Method for removing static hazards.
- Design of a D-type flip-flop with positive clock edge trigger.
- Examples of MSA design.

7. WORKLOAD: THEORY/PRACTICE

2 sessions per week for 2 hours

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

The course Digital Systems II is focused on the design in engineering.

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 mathematics, science and engineering.	High	**2,3**	Apply the knowledge gained in Electricity Networks courses, Electronics and Digital Systems I.
b) An ability to design and conduct experiments, and to analyze and interpret data	Medium	**4**	Able to analyze the results of simulation of digital systems designs. .

c) An ability to design a system, component or process to satisfy realistic constraints.	Medium	**1,4**	Designing various circuits of the Synchronous Sequential Machines and Digital Systems of small and medium scale of integration.
d) An ability to function on multidisciplinary teams.	Low		
e) An ability to identify, formulate and solve engineering problems.	High	**2,3,4**	Perform a real circuit design moderately in complex.
f) An understanding of ethical and professional responsibility.	---		
g) An ability to communicate effectively.	Low		Take several written test. 2 lessons and 3 exams and two written homework.
h) A broad education necessary to understand the impact of engineering solutions in a social, environmental, economic and global context.	Medium		Understand that digital circuits impact on the modern equipment .
i) A recognition of the need for, and an ability to engage in life-long learning.	Medium	**4**	Be prepared to design using techniques, which may change in the medium time.
j) A knowledge of contemporary issues.	Medium	**3,4**	Must have fundamental vision in digital design and have the ability to migrate to new technologies.
k) An ability to use the techniques, skills, and modern tools necessary for engineering practice.	High	**3,4**	To practice with the modern simulators concepts and designs studied in class.
l) Capacity to lead, manage and undertake projects.			

10. EVALUATION IN THE COURSE

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

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

Created by	Eng. Ronald Ponguillo
Date	April 1, 2013

12. APPROVAL

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Mrs.Leonor Caicedo G.	NAME: Eng.Marcos Mendoza
SIGNATURE:	SIGNATURE:

ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Ing. Marcos Mendoza V.
DIRECTOR DE LA SECRETARIA TÉCNICA ACADÉMICA

Date of approval by the Directive Council: 2013-537 2013-10-7	

13. VALIDITY OF THE SYLLABUS

RESOLUTION OF THE POLYTECHNIC BOARD:	13-12-343
DATE:	2013-12-12