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

1. CODE AND NUMBER OF CREDITS

CODE	FIEC00679	
NUMBER OF CREDITS: 3	**Theoretical: 0**	**Practical: 3**

2. COURSE DESCRIPTION

The course of Digital Systems Laboratory provides a practical application of the knowledge acquired in the previous courses Digital Systems I and II, allowing the student to improve their skills in the digital systems design on small and medium scale of integration, using the hardware description language VHDL and CAD tools for design, simulation and hardware debugging. In addition, activities in the Laboratory aid the development of students' ability to work together and share responsibilities.

3. PRE-REQUISITES AND CO-REQUISITES

PRE-REQUISITES	FIEC00745 DIGITAL SYSTEMS II FIEC01800 ELECTRICAL NETWORKS LABORATORY
CO-REQUISITES	

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

CORE TEXT	1. Ponguillo R. & Gorenkova L., Fundamentals of CPLDs and FPGAs, Digital Systems Laboratory Manual, Second Edition, 2013, Internal Publication
REFERENCES	1. Brown S. & Z. Vranesic, Fundamentals of Digital Logic with VHDL Design, Second Edition, 2006, McGraw Hill. 2. J. Wakerley, Digital Design, Principles and Practices, 2001, McGraw Hill. 3. Perez S. and Soto E., Digital System Design with VHDL, 2002, Thomson. 4. Villar E. and others, VHDL Standard Electronic Design Language, 1998, McGraw Hill. 5. Billed E. and others, Programmable Logic Devices and Applications, 2002 Thomson. 6. W. Fletcher, An Engineering Approach to Digital Design. Prentice Hall 7. R. Tocci, Digital Systems, Principles and Applications, 2001, Prentice Hall. 8. Hernandez A., Introduction to Digital Design Combinational and Sequential Circuits, CIME, 2002, ISPJAE. 9. "THE TTL DATA BOOK", Author: Texas Instruments.

5. COURSE LEARNING OUTCOMES

At the end of the course, the student will be able to:
1. Create Digital systems of medium complexity, using design concepts learned in previous courses Digital Systems I and II.
2. Understand the differences between CPLD and FPGA, as well as its application in the implementation of Digital Systems.
3. Evaluate criteria about Digital Design of low and high speed and to apply properly.

6. COURSE PROGRAM

I. Lecture about Quartus II (1 session - 3 hours).
II. Lecture about CPLDs and FPGAs (one session - 3 hours).
III. Written lesson about CPLDs and FPGAs. (1 session - 1 hour).
IV. PRACTICE No. 1. (1 session - 3 hours).
- Practical study in use of CPLDs inside on a development board.
- Using CPLD development board to implement the design of a one digit BCD counter.
- Answer to theoretical questions.
- To determine propagation delays of two CPLDs in the same family.

V. PRACTICE No. 2. (1 session - two hours).
- Practical study in use of FPGAs inside on a development board.

- Using FPGA development board to implement the design of a one digit BCD counter.
- Answer to theoretical questions.
- To determine propagation delays of two CPLDs in the same family.

VI. PROJECT No. 1. (Session - 6 hours).
- Design, simulation and implementation of a MSS using the Altera Quartus II and development board with CPLD.

VII. PROJECT No. 2. (Sessions - 9 hours).
- Design, simulation and implementation of a Digital System using Integrated Circuits of TTL logic family and SPLDs (EPROM).

VIII. PROJECT No. 3. (Sessions - 15 hours).
- Design, simulation and implementation of a digital system using the Quartus II tool of Altera and card FPGA development.

7. WORKLOAD: THEORY/PRACTICE

1 weekly Session of 3-hour

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

The course Digital Systems Laboratory 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.	Medium	1,3	Apply knowledge adquired in courses Electronics and Digital Systems I and II.
b) An ability to design and conduct experiments, and to analyze and interpret data	Medium	1,2	Perform the practices for to develop skills for to work with PLDs and FPGAs.
c) An ability to design a system, component or process to satisfy realistic constraints.	High	1,2,3	To design, simulate, implement, and test various digital systems projects of small and medium scale.
d) An ability to function on multidisciplinary teams.	Low	0	To know technical material of other areas of engineering.
e) An ability to identify, formulate and solve engineering problems.	Medium	1	During the project work identify and resolve multiple problems.
f) An understanding of ethical and professional responsibility.	Low	0	Deliver on time projects.
g) An ability to communicate effectively.	Low	0	At the end of each project will be submit the written report and will do its defense in front of the teacher.
h) A broad education necessary to understand the impact of engineering solutions in a social, environmental, economic and global context.	Low	0	
i) A recognition of the need for, and an ability to engage in life-long learning.	High	2,3	Be prepared to design digital systems using techniques that can change in the medium term.

j)	A knowledge of contemporary issues.	High	2,3	Use devices, techniques and modern design tools.
k)	An ability to use the techniques, skills, and modern tools necessary for engineering practice.	Medium	2,3	Use current simulators and hardware.
l)	Capacity to lead, manage and undertake projects.	Medium	0	Select and search materials and solve another problems associated with the project.

10. EVALUATION IN THE COURSE

Evaluation activities	
Exams	
Tests	X
Homework/tasks	
Projects	X
Laboratory/Experiments	X
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	30 DE MARZO 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
Date of approval by the Directive Council: 2013-537 2013-10-7	Ing. Marcos Mendoza V. DIRECTOR DE LA SECRETARIA TÉCNICA ACADÉMICA

13. VALIDITY OF THE SYLLABUS

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