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

1. CODE AND NUMBER OF CREDITS

CODE	FIEC05561	
NUMBER OF CREDITS: 6	**Theoretical: 4**	**Practical: 2**

2. COURSE DESCRIPTION

This course covers basic concepts about PIC Microcontrollers with 14 and 16 bits of program memory. Emphasizing medium size microcontrollers using assembler and C languages. Architecture and instructions studied are reinforced with practical applications that convey to two projects applying knowledge acquired in this course. For the practical design of applications, hardware and software tools from microcontroller manufacturers are employed.

3. PRE-REQUISITES AND CO-REQUISITES

PRE-REQUISITES	FIEC00299 DIGITAL SYSTEMS I
	FIEC04341 PROGRAMMING FUNDAMENTALS
CO-REQUISITES	

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

CORE TEXT	1. Microcontrollers Programming in C. Autor: Milan Verle. Editorial: MikroElektronika, 1st edition (2009).
REFERENCES	1. Microcontroladores PIC: Diseño Práctico de Aplicaciones, Autor: J.Ma. Angulo, I.Angulo. Editorial McGraw Hill, 1999.- Segunda Parte (PIC 16F8XX).
	2. PIC Micro MCU C. An Introduction to Programming the Microchip Pic in CCS C. Autor: Nigel Gardner.
	3. MikroElektronika Technical Library. Sitio Web: www. mikroe.com
	4. MICROCHIP Technical Library. Sitio Web: Microchip.com
	5. Hojas de datos de componentes.Sitio Web: www.datasheetcatalog.com

5. COURSE LEARNING OUTCOMES

At the end of the course, the student will be able to:
1. Design and implement microcontrollers' based systems.
2. Develop programs in Assembler and C Languages for general purpose applications

6. COURSE PROGRAM

I. Microcontroller's Internal Architecture: (4 hours)
- Generalities
- Program Memory
- Data Memory
- EEPROM Memory

II. Microcontroller's Characteristics (14 hours)
- Instruction Set and Assembler Directives
- Data mode addressing
- Work Register
- Configuration Register
- Delays
- Tables
- Use of buttons, Switches, LEDS and 7 Segment Displays
- Clock System
- Timers

III. Interrupts: (2 hours)
- Interrupt System
- Interrupt causes

IV. EEPROM Memory: (2 hours)
- Reading and Writing EEPROM Memory

V. Especial Resources: (4 hours)
- Analog to Digital Convertor
- RS-232 Communication

VI. Summary: (2 hours)
- General Summary
- Preparation for Partial Exam

VII. C Language for Microcontrollers: (4 hours)
- Structure
- Directives
- Types of Data
- Variables

VIII. Basic Principles for Microcontrollers Programming in C Language (6 hours)
- Pointers
- Declaration of Variables
- Constants
- Operators
- Control Loops
- Arrays
- Functions

IX. Library Management in C Language: (2 hours)
- Library System

X. Especial Resources in C Language (10 hours)
- Use of the EEPROM Memory
- Keyboard
- LCD
- Comparison and Capture
- Analog to Digital Convertor

XI. Serial Communication (4 hours)
- RS232Comunication in C Language for Microcontrollers
- I2C Communication in C Language for Microcontrollers

XII. Summary: (2 hours)
- General Summary
- Preparation for Final Exam

7. WORKLOAD: THEORY/PRACTICE

4 hours of theory per week in two sessions of two hours each.
2 hours of Laboratory per week in a two hour session.

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

After this course the student acquires a general basic ability to design digital systems based on microcontrollers using hardware and software tools to optimize designs.

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	Be able to solve class problems with given specifications.
b)	An ability to design and conduct experiments, and to analyze and interpret data	Medium		Use high and low level languages in his designs.
c)	An ability to design a system, component or process to satisfy realistic constraints.	High	1,2	Design systems with specifications based on real problems.
d)	An ability to function on multidisciplinary teams.	---		
e)	An ability to identify, formulate and solve engineering problems.	Medium	1	Use hardware and software tools.
f)	An understanding of ethical and professional responsibility.	---		
g)	An ability to communicate effectively.	---		To know to defend and support a finding of design used in lessons and exams.
h)	A broad education necessary to understand the impact of engineering solutions in a social, environmental, economic and global context.	---		
i)	A recognition of the need for, and an ability to engage in life-long learning.	---		
j)	A knowledge of contemporary issues.	---		
k)	An ability to use the techniques, skills, and modern tools necessary for engineering practice.	Medium	1	Acquire abilities in the design and development of microcontroller's systems.
l)	Capacity to lead, manage and undertake projects.	---		

10. EVALUATION IN THE COURSE

Evaluation activities	
Exams	x
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. Carlos Valdivieso
Date	May 20 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