



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

1. CODE AND NUMBER OF CREDITS

CODE	FIEC00190	
NUMBER OF CREDITS : 4	Theoretical: 4	Practical: 0

2. COURSE DESCRIPTION

Electronics II presents a set of applications and basic configurations transistor arrays, useful at different stages of an amplification system with analogue electronics.
 Furthermore the course presents the operational amplifier (OPAMP) and their settings and key applications.
 At the last there is an introduction to the subject of Power Electronics, presenting thyristors and their applications.

3. PRE-REQUISITES AND CO-REQUISITES

PRE-REQUISITES	FIEC00075 Electronics I FIEC01784 Electrical Networks Analysis II
CO-REQUISITES	

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

CORE TEXT	1. R. Boylestad, L. Nashelsky. Electronic devices and circuit theory. Pearson, 10ma edición. 2009.
REFERENCES	1. A. S. Sedra y K. C. Smith. Microelectronic circuits. McGraw-Hill, 5 th edition. 2006. 2. R. F. Coughlin, F. F. Driscoll Operational amplifiers and linear integrated circuits. Prentice Hall, 5 th edition. 1999.

5. COURSE LEARNING OUTCOMES

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

1. Design an amplifier circuit using FETs.
2. Design multi-stage amplifier circuits considering specific bandwidths, using BJT and FET transistors.
3. Understand and analyze power amplifier circuits.
4. Design a power amplifier circuit including thermal considerations.
5. Understand the design and implementation of differential amplifier circuits.
6. Understand and design basic circuits using operational amplifiers.

6. COURSE PROGRAM

- I. FIELD EFFECT TRANSISTORS (FET). (4 sessions – 8 hours)
 - Field Effect Transistors (JFET): internal structure, types and polarization.
 - Field Effect Transistor (depletion MOSFET): internal structure, types and polarization.
 - Field Effect Transistor (enhancement MOSFET): internal structure, types and polarization
 - Discrete and integrated MOSFETs.
- II. SMALL SIGNAL AMPLIFIERS USING FETS (4 sessions – 8 hours)
 - n and T equivalent circuits including output resistance (ro)
 - Common gate, source and drain circuits.
 - Voltage Gain (Av) and current gain (Ai)
 - Input impedance (Zi) and output impedance (Zo).
 - Differences in the models of discrete and integrated MOSFETs.
- III. MULTISTAGE AMPLIFIERS (Sessions – 8 hours)
 - Miller's Theorem
 - Connections: cascade, Darlington, current mirrors
 - Multistage Amplifiers (BJT and FET)
- IV. FREQUENCY RESPONSE FOR FETS AND BJTS. (Sessions – 8 hours)
 - Introduction and basic concepts
 - Low frequency response.
 - High frequency response.



- V. POWER AMPLIFIERS. (Sessions – 8 hours)
- AC load line concept.
 - Class A amplifier.
 - Class A transformer coupled amplifier.
 - Class B amplifier.
 - Class AB amplifier.
 - Integrated power amplifiers.
 - Power dissipation and the need for heat sinks.
- VI. DIFFERENTIAL AMPLIFIERS. (Sessions – 8 hours)
- Introduction and basic concepts.
 - The differential pair of BJT and MOSFET
 - Analysis and input and output characteristics.
 - DC analysis of a differential amplifier.
 - AC analysis of a differential amplifier.
 - Common mode rejection ratio (CMRR).
 - Speed of response.
 - Active load differential pair
- VII. OPERATIONAL AMPLIFIERS (OPAMPS). (Sessions – 8 hours)
- Real OPAMP characteristics.
 - Effects of negative feedback.
 - Integrator amplifier.
 - Adder-integrator amplifier.
 - Differentiator amplifier.
 - Adder-differentiator amplifier.
 - Application: instrumentation amplifier, phase shifter, voltage to current converters (V-I) and current-voltage converters (I-V)
 - Analogue to digital, and digital to analog converters.
 - Unipolar amplifiers.
 - Applications with the proportional integral derivative (PID) controller.

7. WORKLOAD: THEORY/PRACTICE

2 sessions per week for 2 hours each.

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

Electronics II is aimed at engineering design.

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	1, 2, 3, 4, 5, 6	Apply the concepts of frequency domain and modeling components.
b) An ability to design and conduct experiments, and to analyze and interpret data			
c) An ability to design a system, component or process to satisfy realistic constraints.	Low	5	Design circuits using specifications from the real characteristics.
d) An ability to function on multidisciplinary teams.			
e) An ability to identify, formulate and solve engineering problems.	Low	1, 6	Know different configurations of elements and then choose the most adequate.



f)	An understanding of ethical and professional responsibility.			
g)	An ability to communicate effectively.			
h)	A broad education necessary to understand the impact of engineering solutions in a social, environmental, economic and global context.	Low	5	Understand new electronic technologies.
i)	A recognition of the need for, and an ability to engage in life-long learning.	Low		Use new components and technologies.
j)	A knowledge of contemporary issues.	Low		Recognize new schemes in the Electronics.
k)	An ability to use the techniques, skills, and modern tools necessary for engineering practice.	High	1, 2, 3, 6	Use simulators and understand results.
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	Master Carlos Salazar López.
Date	17 de mayo 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:
Date of approval by the Directive Council: 2013-537 2013-10-7	ESUELAS SUPERIOR POLITÉCNICA DEL LITORAL Ing. Marcos Mendoza V. DIRECTOR DE LA SECRETARIA TÉCNICA ACADEMICA

13. VALIDITY OF THE SYLLABUS

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