Subject: Analog and Power Circuits
Code: 18478
Institution: Escuela Politécnica Superior
Degree: Telecommunication Technologies and Services Engineering
Level: Graduate
Type: Core course
ECTS: 6

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1. COURSE TITLE

ANALOG AND POWER CIRCUITS

1.1.   Course number

18478

1.2.   Course area

Electronic Circuits and Microprocessors

1.3.   Course type

Core course

1.4.   Course level

Graduate

1.5.   Year

2º

1.6.   Semester

1º

1.7.   Credit allotment

6

1.8.   Prerequisites

1.9.   Minimum attendance requirement

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1.10. Faculty data

Add @uam.es to all email addresses below.

Theory:

> **Jose Luis Castaño Palazón** (Coordinador)
> Departamento de Física Aplicada
> Facultad de Ciencias
> Office – Edificio 01 (Ciencias), módulo 12, Planta 6ª, Despacho 603
> Teléfono: +34 91 497 4510
> e-mail: jose.luis.castano
> web: https://moodle.uam.es/
> Horario de atención al alumnado: Con cita previa por correo electrónico.

1.11. Course objectives

This course is an introduction to the analog treatment of electric signals and, at the same time, presents the basic concepts of energy conversion and power electronics.

The first chapter presents the concept of amplification as well as the techniques used to analyze the behavior of an amplifier block and to obtain its main parameters.

It follows the study of the main amplifying device to deal with low power signals, the operational amplifier, and also the concept of feedback.

Several simple and basic circuits based on operational amplifier are presented. The study of these simple circuits is intended to understand its behavior as well as to allow choosing and designing the adequate circuit for different simple applications.

Next, bipolar and MOSFET transistor are presented, as well as the different classes of amplifiers based on these devices.

In the final part of the course, and after a survey of the different ways for obtaining electrical energy, the devices and basic circuits for electrical power conversion are presented, especially those used in the field of photovoltaic solar energy.

Also, in this course, the usual tools used for analog circuit simulation are studied. They constitute a powerful mean for studying the behavior, not just of simple circuits, but also of more complex ones whose study would be difficult without these software tools.

1.12. Course contents

<u>**Condensed Table of Contents**</u>

CHAPTER 1.   Amplification
CHAPTER 2.   Operational amplifiers and Feedback
CHAPTER 3.   Amplification with transistors
CHAPTER 4.   Energy conversion and power electronics

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Detailed Table of Contents

CHAPTER 1.   Amplification
- Two-port networks
- Types of amplifiers
- Transfer Function and frequency response
- Bode Plots

CHAPTER 2.   Operational amplifiers and Feedback
- Ideal Operational Amplifier
- Basic Circuits
- Filters
- Positive and Negative Feedback
- Oscillators
- Non linear Applications

CHAPTER 3.   Amplification with transistors
- Bipolar and MOSFET transistors
- Configurations and linear models
- Bias circuits
- Classes of amplifiers

CHAPTER 4.   Energy Conversion and power electronics
- Energy sources and energy conversion
- Devices for power electronics
- Rectifiers
- Regulators
- Inverters and switched converters
- Photovoltaic solar energy

1.13.   Course bibliography

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"Electrónica", A.R. Hambley. Ed. Prentice Hall (Pearson Educación), 2ª edición (2001).

"Análisis y diseño de circuitos electrónicos", vols. 1 y 2, D.A. Neamen. Ed. McGraw-Hill, 1ª edición (1999-2000).

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"OrCAD PSpice para Windows", vols. 1 y 2, R.W. Goody. Ed. Prentice Hall (Pearson Educación), 3ª edición (2002-2003).