Course guides
230082 - FDE - Fundamentals of Electronics

Last modified: 30/04/2020

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Compulsory subject).

Academic year: 2020 **ECTS Credits:** 7.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Voz Sanchez, Cristobal

Others: Bermejo Broto, Alexandra
Fernandez Chimeno, Mireya
Guede Fernández, Federico
Lopez Gonzalez, Juan Miguel
Mateu Mateus, Marc
Orpella Garcia, Alberto
Puigdollers Gonzalez, Joaquin
Rodriguez Martinez, Angel
Rosell Ferrer, Francisco Javier
Rubio Sola, Jose Antonio
Vargas Drechsler, Manuel Agustin

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:
10 ECI N1. They will have acquired knowledge related to experiments and laboratory instruments and will be competent in a laboratory environment in the ICC field. They will know how to use the instruments and tools of telecommunications and electronic engineering and how to interpret manuals and specifications. They will be able to evaluate the errors and limitations associated with simulation measures and results.

TEACHING METHODOLOGY

Theoretical classes
Laboratory classes
Cooperative work (out of classrooms)
Individual work (out of classrooms)
Short answer controls (Test)
Long answer controls
Long answer controls (Final examination)
Laboratory
Laboratory examination

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

Type	Hours	Percentage
Hours small group	26,0	14.86
Self study	97,0	55.43
Hours large group	52,0	29.71

Total learning time: 175 h

CONTENTS

Analysis of electric circuits

Description:
Electric charge, current and potential. Components and electrical circuits. Conductive elements and switches. Voltage and current independent sources. Resistance and Ohm's law. Equivalent resistance. Linear controlled sources. Electrical Power. Kirchhoff's law. Analysis of electrical circuits by the junction and loop rules. Linear circuit. Superposition. Thevenin and Norton equivalent circuits. Signal and power electrical transfer.

Full-or-part-time: 50h
Theory classes: 20h
Self study : 30h

The capacitor and the inductor

Description:
The capacitor as electrical element. Capacity. Equivalent capacitor. The inductor as electrical element. Induction. Equivalent inductor. Transient analysis of first order electrical circuits with capacitors and inductors. Electrical energy in capacitors and inductors.

Full-or-part-time: 12h
Theory classes: 5h
Self study : 7h

The junction diode and its applications

Description:
Introduction to semiconductor physics. Concept of semiconductors. The silicon case. Intrinsic and doped semiconductor. Charge carriers: the electron and the hole. Energy bands. Drift and diffusion currents. The PN junction diode. Rectifying effect. Breakdown of the diode.
The diode as an element of electronic circuits. Approximated models for the diode. Ideal and piecewise linear models. Analysis of circuits with diodes using simplified models. Applications of the diode. Rectifying, limiting and stabilizing circuits.

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

The transistor and the signal amplifier

Description:
The bipolar junction transistor. Input and output characteristics. Regions of operation and basic equations. The field-effect transistor. Input and output characteristics. Regions of operation and basic equations. Amplifying circuits based on transistors. Power supply, signal and load in electronic circuits. Biasing of the transistor. Bias point. Small signal equivalent circuit. Voltage gain, input and ouput resistances. Load line and dynamic range.

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

Laboratory of Electronic

Description:
1. Presentation of the Laboratory
2. The power source and the digital multimeter
3. Electric measurements in DC
4. The oscilloscope and function generator
5. Introduction to the operational amplifier
6. Introduction to RC circuits
7. Control of electronic instrumentation
8. Fabrication of a wave square generator
9. Electric characteristic of a diode, LED and Zener
10. The transformer, rectifying circuits and capacitor filter.
11. The bipolar junction transistor: DC analysis
12. Signal amplification with a bipolar junction transistor

Full-or-part-time: 60h
Laboratory classes: 26h
Self study : 34h

GRADING SYSTEM

Laboratory: 20% (20% practice, 40% instrumentation exam in the laboratory, 40% final laboratory exam)
Theory: 80% (5% ongoing evaluation in the group, 35% midterm exam, 60% final exam)
Reassesment of theory (80% of the subject) according to regulation. The laboratory mark (can not be reassesed) will be that of the course with the same weight (20% of the subject).

BIBLIOGRAPHY

Basic:
- Prat Viñas, Lluís; Bragós Bardia, Ramon. Circuits i dispositius electrònics : fonaments d'electrònica [on line]. 2a ed. Barcelona: Edicions UPC, 2002 [Consultation: 13/07/2015]. Available on: http://hdl.handle.net/2099.3/36163. ISBN 8483015749.
- Thomas, R. E; Rosa, A. J. Circuitos y señales : introducción a los circuitos lineales y de acoplamiento. Barcelona [etc.]: Reverté, 1991. ISBN 8429134581.

Complementary:
- Malik, N. R. Circuitos electrónicos : análisis, diseño y simulación. Madrid [etc.]: Prentice Hall, 1996. ISBN 8489660034.
- Senturia, S. D; Wedlock, Bruce D. Electronic circuits and applications. New York: John Wiley and Sons, 1975. ISBN 0471776319.
- Floyd, T. L. Electronics fundamentals : circuits, devices, and applications. 8th ed. Upper Saddle River, NJ [etc.]: Prentice Hall, 2010. ISBN 9780135096833.