Course guide
240781 - 240781 - Electronics

Last modified: 27/06/2023

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

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGIES AND ECONOMIC ANALYSIS (Syllabus 2018). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: Suñe Socias, Victor Manuel

Others: Bordonau Farrerons, Jose
Ovejas Benedicto, Victòria Júlia

PRIOR SKILLS

Physics, mathematics, and electrical circuit theory (college level)

REQUIREMENTS

None

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEGTI 9. (ENG) Coneixement d'electrònica, electricitat, teoria de circuits i màquines elèctriques.

Generical:
CGGTI 3. (ENG) Coneixement en matèries bàsiques i tecnològiques que capacitin per a l'aprenentatge de nous mètodes i teories, i doti de versatilitat per adaptar-se a noves situacions.
CGGTI 5. (ENG) Coneixements per a la realització de medicions, càlculs, valoracions, tasacions, peritacions, estudis, informes, plans de treball i altres treballs similars.
CGGTI10. (ENG) Capacitat de treballar en un entorn multilingüe i multidisciplinar.

Transversal:
CT7. (ENG) TERCERA LLENGUA: Conèixer una tercera llengua, preferentment l'anglès, amb un nivell adequat oral i escrit, i en consonància amb les necessitats que indran els titultats i titulades.
CT6. (ENG) APRENENTATGE AUTÒNOM: Detectar mancances en el propi coneixement i superar-les mitjançant la reflexió crítica i l'elecció de la millor actuació per ampliar aquest coneixement.

TEACHING METHODOLOGY

The course will include lectures delivered in the classroom, watching of videos, readings, application activities in which the students will be asked to carry out analysis/design tasks, delivering a report, lab activities in which the students will have to assemble and test electronic systems, and doing a challenge - based project

LEARNING OBJECTIVES OF THE SUBJECT

After successfully completing this course students should be able to:

- Distinguish, in an electronic system, the inputs (sensors), the outputs (actuators), the signal processing subsystem, and the power supply subsystem

- Know some usual electronic sensors and understand how they work

- Know some usual electronic actuators and understand how they work

- Know the difference between analog and digital signal processing

- Know the basics of analog signal processing using discrete electronic components, with emphasis placed on the usual analog discrete electronic components (op amp, diode, transistor)

- Know how to analyze and how to synthesize simple analog processing subsystems based on discrete components with emphasis on the usual analog discrete electronic components (op amp, diode, transistor)

- Know the basics of some power supply and voltage regulation subsystems.

- Know the basics of digital signal processing using discrete electronic components, with emphasis placed on the usual digital discrete electronic components (logic gate, biestable)

- Analyze and to sinthesize simple digital processing subsystems using discrete electronic components, with emphasis placed on the usual digital discrete electronic components (logic gate, biestable)

- Know the basics of microcomputers/microcontrollers as well as some of its applications

- Know the basics of analog-to-digital and digital-to-analog conversion as well as some of the available types of analog-to-digital and digital-to-analog converters.

- Know the main instruments of a basic electronics lab, to know how to use them, and to be able to assemble and test simple electronic circuits/systems.

- Connect what you learn in the course with other courses of the degree, working on the proposal of an innovative idea for the creation of a start-up, including some part of electronic technology

STUDY LOAD

Type	Hours	Percentage
Hours large group	48,0	37.65
Self study	67,5	52.94
Hours small group	12,0	9.41

Total learning time: 127.5 h

CONTENTS

Course introduction

Description:
Electronic systems: its interest and usefulness; course learning goals; syllabus

Full-or-part-time: 1h 02m
Theory classes: 0h 30m
Self study : 0h 32m

Electronic systems

Description:
The electronic system as an interplay between sensors, core for signal processing (analog and/or digital), actuators, and power supply subsystem; analog signal processing vs digital one

Specific objectives:
- To distinguish, in an electronic system, the inputs (sensors), the outputs (actuators), the signal processing core, and the power supply subsystem

- To distinguish between analog and digital signal processing.

Related activities:
Application activities; lab activities

Full-or-part-time: 2h 24m
Theory classes: 1h
Self study : 1h 24m

Sensors

Description:
Description of usual electronic sensors

Specific objectives:
To have some knowledge about usual electronic sensors

Related activities:
Application activities; lab activities

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study : 2h 48m

Actuators

Description:
Description of usual electronic actuators

Specific objectives:
To have some knowledge about usual electronic actuators

Related activities:
Application activities; lab activities

Full-or-part-time: 2h 24m
Theory classes: 1h
Self study : 1h 24m

Analog processing subsystems

Description:
- Amplification
- Operational amplifiers (op amp)
- Diodes
- Field-effect transistors (FET)
- Bipolar junction transistors (BJT)
- Power supplies and voltage regulators

Specific objectives:
- To know the basics of analog signal processing using discrete electronic components, with emphasis placed on the usual analog discrete electronic components (op amp, diode, transistor)

- To know how to analyze and how to synthesize simple analog processing subsystems based on discrete components, with emphasis placed on the usual analog discrete electronic components (op amp, diode, transistor)

- To know the basics of some power supply and voltage regulation subsystems.

Related activities:
Application activities; lab activities

Full-or-part-time: 46h 06m
Theory classes: 22h 30m
Self study : 23h 36m

Digital processing subsystems

Description:
- Digital systems
- Sequential systems
- Discrete digital devices
- Microcomputers
- Data adquisition and conversion

Specific objectives:
- To know the basics of digital signal processing using discrete electronic components, with emphasis placed on the usual digital discrete electronic components (logic gate, biestable)

- To be able to analyze and to sinthesize simple digital processing subsystems using discrete electronic components, with emphasis placed on the usual digital discrete electronic components (logic gate, biestable)

Related activities:
Application activities; lab activities

Full-or-part-time: 42h 30m
Theory classes: 21h
Self study : 21h 30m

GRADING SYSTEM

The course grade will be computed from the mark of two written exams (20% the first one, 40% the second exam), from the average mark of the reports of the application tasks (15%), from the mark of a practical exam about the lab activities (25% * 2 / 3) and from the mark of the challege - based project (25% * 1 / 3), or from the mark of a final exam (75%), the mark of the exam about the lab activities (25% * 2 / 3) and from the mark of the challege - based project (25% * 1 / 3)

The first written exam will be administred about the middle of the term on the date set up by the School and the exam's goal will be to assess the degree of achievement of the learning objectives corresponding to the course content covered until then; the second written exam will be administred at the end of the term on the date set up by the School and the exam's goal will be to assess the degree of achievement of all the learning objectives of the course save the last two ones; the exam about the lab activities will be administred at the end of the term and the exam's goal will be to assess the degree of achievement of the last but one learning objective of the course; the final exam will be delivered at the end of the term on the date set up by the School, only students fulfilling the corresponding requirements set up by the School will be allowed to write the exam, and its goal will be to assess the degree of achievement of all the learning objectives of the course save the last two ones.

The course mark will the the maximum of

M1 = 0,2 * MAX (EX1M, EX2M) + 0.4 * EX2M + 0,15 * ATAM + 0,25 * (2 / 3) EXLAM + 0,25 * (1 / 3) * CBPM

and

M2 = 0,75 * FEM + 0,25 * (2 / 3) EXLAM + 0,25 * (1 / 3) * CBPM,

where

EX1M: Mark of the first exam
EX2M: Mark of the second exam
ATAM: Average mark of the reports of the application tasks
EXLAM: Mark of the practical exam about the lab activities
CBPM: Mark of the challenge - based project
FEM: Mark of the final exam

EXAMINATION RULES.

Exam rules will be given well in advance.

BIBLIOGRAPHY

Basic:
- Horowitz, Paul. The Art of electronics. Third edition. New York: Cambridge University Press, 2015. ISBN 9780521809269.

Complementary:
- Storey, Neil. Electronics: A Systems Approach [on line]. 6th ed. Harlow: Pearson, 2017 [Consultation: 16/02/2022]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=5186355. ISBN 9781292114064.
- Platt, Charles. Make: electronics [on line]. 3rd ed. Sebastopol, CA [etc.]: Make Community, 2021 [Consultation: 20/04/2023]. Available on:

https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6735003. ISBN 9781680456851.
- Scherz, Paul. Practical electronics for inventors [on line]. 4th ed. New York: McGraw-Hill, 2016 [Consultation: 29/03/2023]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6423455. ISBN 9781259587559.
- Mancini, Ron; Carter, Bruce. Op amps for everyone [on line]. 5th ed. Oxford: Newnes, 2018 [Consultation: 22/12/2021]. Available on: https://www-sciencedirect-com/book/9780128116487/op-amps-for-everyone. ISBN 9780128116487.