COURSE DATA

Data Subject	
Code	34935
Name	Analogue electronics systems
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1404 - Degree in Industrial Electronic Engineering	School of Engineering	3	First term

Subject-matter

Degree	Subject-matter	Character
1404 - Degree in Industrial Electronic Engineering	16 - Electronic systems	Obligatory

Coordination

Name	Department
SANCHIS PERIS, ENRIQUE J	242 - Electronic Engineering

SUMMARY

This subject belongs to the matter is Electronic Systems, which is part of the common industrial engineering branch bloc. This subject is lectured in the first quarter of the third year of the Degree of Industrial Electronics Engineering. It has a load of 6 ECTS, which translates into a total workload for the student of 150 hours. 60 hours are in the classroom and 90 hours are individual work of the student. The 6 ECTS are subdivided in 3 ECTS of theory, 1 ECTS of problems solving and 2 ECTS of lab work.

In this subject the student will learn analogue electronic circuits and systems based on the elements seen in previous years (diodes, transistors and opamps). This will allow the student to design more complex electronic systems and know their limitations.

Once the student has passed the subject he will be able to recognise almost all electronic system blocs as well as specify and design them. He will also learn tools to analyse, simulate and understand new blocs that he has not seen in the subject.

The student will learn basic circuits with transistors, opamps (linear and non linear), filters, oscillators and linear power supplies and regulators.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is highly recommendable that the student has passed the subjects of Linear Circuits Theory and Electronic Technology, both belonging to the matter of Principles of Electronics and Electric Technology of the first and second year of the degree. The student has also to master the basic knowledge of mathematics.

OUTCOMES

1404 - Degree in Industrial Electronic Engineering

- CG3 - Knowledge of basic and technological subjects that allows students to learn new methods and theories and provides them with versatility to adapt to new situations.
- CG4 - Ability to solve problems with initiative, decision-making skills, creativity and critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of industrial engineering (with specific industrial electronics technology).
- CG6 - Ability to deal with specifications, regulations and mandatory standards.
- CE2 - Knowledge of the basics and applications of analogue electronics.
- CE6 - Ability to design analogue, digital and power electronic systems.

LEARNING OUTCOMES

1. Ability to design analogue and digital electronic circuits for industrial applications. (CG4, CE6)
2. Ability to analyse the behaviour of an analogue electronic circuit. (CG3, CE2)
3. Ability to choose the right circuit type after knowing the requirements. (CG3, CG6, CE2, CE6)

4. Ability to design an electronic circuit following some specifications. (CG4, CE2, CE6)

DESCRIPTION OF CONTENTS

1. Signal amplification

- Signal amplification foundations
- Cascade amplifiers
- Models
- Frequency response

2. Ideal Opamp

- Input differential stage
- Ideal opamp
- Opamp-based amplifiers schemes
- Opamp-based amplifiers design
- Instrumentation amplifier
- AD/DA converters

3. Real Opamp behaviour

- Input and output impedance
- Bandwith limitation
- Constant Gain-Bandwith product
- Other limitations: maximum amplitude, slew-rate, errors

4. IC Amplifiers

- Differential amplifier analysis
- Current sources
- Opamp circuits schemes
- Feedback amplifiers. Negative feedback effects

5. Oscillators and timing circuits

- Oscillation criteria
- Wien bridge and phase shift oscillator
- Opamp based oscillators. Relaxation oscillator
- Timing circuits

6. Filters

- Pasive filters
- Active filters. Butterworth filter. Other filters
- Sallen-Key cells. Other configurations
- RLC selective networks. Application to tuned amplifiers and LC oscillators.

7. Linear power supplies

- Transformer
- Rectifier
- Linear regulators

8. Lab work

Experiment 1: Simulation and experimental set up of a summing amplifier.
Experiment 2: Simulation and experimental set up of a Schmitt trigger.
Experiment 3: Simulation and experimental set up of a filter.
Experiment 4: Simulation and experimental set up of an oscillator.
Experiment 5: Simulation and experimental set up of a linear power supply.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Study and independent work	15,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	45,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

Teaching methodology will be based on problem solving (CG4, CG6, CE6) and lecturing (CG3, CE2), using audio-visual resources. The student will have to work autonomously both alone and in groups.

EVALUATION

The evaluation of the subject, in each of the two official calls, will be obtained from the result of the examination of each of them and will consist of a part of theory-problems, ETyP, and a part of laboratory, EL, forming the final note, NF. For the positive evaluation of the subject in any of the two calls, the value of NF will be required to be at least 5 points out of 10.

The final grade, NF, of the subject will be obtained by applying the expression NF = (2/3) x ETyP + (1/3) x EL for students who have obtained a minimum score of 5 out of 10 in each of both parties (ETyP and EL). Students who do not achieve the minimum grade required in one of the two parts, or in both, will have a final value, NF, equal to the lower of the two grades (ETyP and EL).

Next, the ETyP and EL evaluation procedure is detailed for each of the two official calls:

Theory and Problem Assessment (ETyP):

It will consist of two parts: a theory part, which will be evaluated by means of a multiple-response questionnaire with error penalties, and a resolution part for one or more problems.

Laboratory evaluation (EL): At least 80% of the practice sessions are considered compulsory. An evaluation will be carried out to obtain the EL value as follows:

Laboratory test, PL, will have a weight of 2/3 in the value of EL and will be evaluated by means of a questionnaire of multiple answers with penalty of errors.

Laboratory work, TL, will weigh 1/3 of the value of EL. For its evaluation, the student will deliver at the end of each practice a report of the work done in it, indicating the methodology followed, the results obtained and the answers to the questions that the teacher may ask throughout the practice. The TL qualification will be the average of those obtained in each practice and will be the same for both official calls.

The weighted average of both evaluations will give the value of EL, that is: EL = (2/3) x PL + (1/3) x TL

Students who have not passed the subject in the first call must take the final exam in the second call. In this case, if she has passed any of the two parts (ETyP and EL), she may skip, if she wishes, the test corresponding to that part.

In any case, the evaluation system will be governed by the one established in the Regulation of Avaluació i Qualificació of the University of Valencia per a Graus i Màsters (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdi ct oSelected = 5639).

REFERENCES

Basic

- Electrónica, A. R. Hambley, Ed. Prentice Hall.
- Principios de Electrónica, A. Malvino, Ed. Mc Graw-Hill.
- The LTSpice IV Simulator: Manual, Methods and Applications, G. Brocard, Ed. Swiridoff.

Additional

- Fundamentos de Electrónica Analógica, J. Espí, G. Camps, J. Muñoz. Colección: Educació. Materials, nº 94. PUV, Universitat de València.
- Electrónica Básica para Ingenieros, G. Ruíz-Robredo, J. García-Fernández, Textos Universitarios, Universidad de Cantabria.
- Electrónica Básica para Ingenieros: problemas resueltos, G. Ruíz-Robredo, J. García-Fernández, Textos Universitarios, Universidad de Cantabria.
- The Art of Electronics, P. Horowitz, W. Hill, Ed. Cambridge University Press.
- Foundations of Analog and Digital Electronic Circuits. A. Agarwal, Ed, Elsevier.
- Amplificadores Operacionales y CI lineales, R.F. Coughlin, F.F. Driscoll, Ed. Prentice Hall.
- Electronics Circuit SPICE Simulations with LTspice: A Schematic Based Approach (Electronics Circuit Simulations) (Volume 1), A. Kumar Singh, R. Singh, Ed. CreateSpace Independent Publishing Platform.