VNIVERSITAT DE VALÈNCIA

Course Guide
34935 Analogue Electronics Systems

COURSE DATA

Data Subject	
Code	34935
Name	Analogue Electronics Systems
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

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 one of them and will consist of a part of theory-problems, ETyP, and a part of laboratory, EL, forming between both the final note, NF. For the positive evaluation of the subject in any of the two calls, the NF value will be required to be a minimum of 5 points out of 10.

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

The ETyP and EL evaluation procedure is detailed below:

Theory and Problem Assessment (ETyP):

For the evaluation of ETyP in the first call, there will be a continuous evaluation throughout the semester, as follows:

- A first partial test, ETyP1, consisting of a theory part - that will be evaluated by means of a multiple choice questionnaire with penalty of errors -, and a part of solving one or more problems. This test will have a weight of 2/3 in the value of ETyP and may eliminate the corresponding subject in the final exam of first call for those students who obtain a minimum grade of 5 points out of 10.

- A second partial test, ETyP2, constituted in the same way and evaluated with the same conditions as the first test, which will be carried out coinciding with the official final exam of the first call. This test will have a weight of 1/3 in the value of ETyP and may be computed in the value of ETyP for those students who obtain a minimum grade of 5 points out of 10.

Students who have passed ETyP1 and ETyP2 will obtain a theory and problems score with a value of ETyP = (2/3) x ETyP1 + (1/3) x ETyP2. Students who have not reached the minimum grade in ETyP1 or ETyP2 must sit the official final ETyP exam corresponding to the second official call. In this test, which will be constituted and evaluated under the same conditions as the two previous tests, the entire content of the theory-problems part will be evaluated.

Laboratory evaluation (EL):

As for the laboratory part, the attendance of at least 80% of the sessions is considered mandatory. An evaluation will be carried out to obtain the value of EL as follows:

- Laboratory test, PL, which will have a weight of 2/3 in the value of EL - which will be evaluated by means of a multiple response questionnaire with penalty of errors - and which will be carried out on the corresponding official date, both in the first and in the second call.

- Laboratory notebook, CL, which will have a weight of 1/3 of the value of EL and that the student must keep updated and available to the teacher throughout the semester, and that must be handed over for the evaluation of the laboratory upon completion of the practices.

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

The student who has not passed the subject on first call must sit the final exam on second call. In this case, if you have passed one of the two parts (ETyP and EL), you may skip, if you wish, the test corresponding to that part.

In any case, the evaluation system will be governed by the provisions of the Evaluation and Qualification Regulations of the Universitat de València for Degrees and Masters.

(https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=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.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Contents

The contents initially collected in the teaching guide are maintained.

Volume of work and temporary planning of teaching

The different activities described in the Teaching Guide are maintained with the planned dedication.

The material for the monitoring of classroom theory / practical classes allows to continue with the temporary teaching planning both in days and in hours, both if the teaching is classroom-based or not, although the student has freedom to follow the non-contact sessions according to your own planning.

Teaching methodology

In classroom theory and practical classes, there will be the maximum possible attendance, always respecting the sanitary restrictions that limit the capacity of the classrooms to 50% of their usual occupation. Depending on the capacity of the classroom and the number of students enrolled, it may be necessary to distribute the students into two groups. If this situation arises, each group will attend classroom theory and practical sessions with a physical presence in the classroom by rotating shifts, thus ensuring compliance with the criteria for occupying spaces. The rotation system will be established once the actual enrollment data is known, guaranteeing, in any case, that the attendance percentage of all the students enrolled in the subject is the same. For classroom sessions and theory sessions that are not face-to-face, there will be a preferably synchronous online teaching model, as long as compatibility with other scheduled activities allows. Online teaching will be carried out by synchronous videoconference respecting the schedule, or, if not possible, asynchronous.

With respect to laboratory practices, attendance at sessions scheduled in the schedule will be totally face-to-face.

Once the actual enrollment data is available and the availability of spaces is known, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaptation to each subject, establishing in said model the specific conditions in which it will be developed teaching the subject.

If there is a closure of the facilities for sanitary reasons that totally or partially affects the classes of the subject, these will be replaced by non-contact sessions following the established schedules.

Evaluation

The evaluation system described in the Teaching Guide of the subject in which the different evaluable activities have been specified as well as their contribution to the final grade of the subject is maintained.

If there is a closure of the facilities for health reasons that affect the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia. The contribution of each evaluable activity to the final grade for the course will remain unchanged, as established in this guide.

Bibliography

The bibliography recommended in the Teaching Guide is kept as it is accessible and is complemented with notes, slides and problems uploaded to the Virtual Classroom as subject material.