

**COURSE DATA****Data Subject**

<b>Code</b>	34951
<b>Name</b>	Ancillary techniques in industrial electronics
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	6.0
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1402 - Degree in Telecommunications Electronic Engineering	School of Engineering	4	Second term
1404 - Degree in Industrial Electronic Engineering	School of Engineering	4	Second term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1402 - Degree in Telecommunications Electronic Engineering	22 - Optional subjects	Optional
1404 - Degree in Industrial Electronic Engineering	21 - Optional subjects	Optional

**Coordination**

<b>Name</b>	<b>Department</b>
SANCHIS KILDERS, ESTEBAN	242 - Electronic Engineering

**SUMMARY**

This subject is optional and is lectured in the fourth 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 all of lab work.

In this subject, students will learn special skills to design a complete Printed Circuit Board, starting with a correct schematics design and continuing with the proper design of the printed circuit board itself. An available software tool will be used, but the skills obtained can be applied to any software tool available in the market



Once the student passes this subject he will be able to design a complete Printed Circuit Board (PCB) following the whole process and complying with the specifications granted. Design criteria to improve electromagnetic compatibility will also be learned.

## 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 related to electronics belonging to the matter of Principles of Electronics and Electric Technology of the first and second year of the degree.

## OUTCOMES

### 1404 - Degree in Industrial Electronic Engineering

- CO1 - More comprehensive skills than those acquired in compulsory subjects must be acquired in elective subjects.

## LEARNING OUTCOMES

- Ability to design printed circuit boards (CO1).
- Ability to know the design criteria of practical printed circuit boards (CO1).
- Ability to use the software to design PCBs (CO1).

## DESCRIPTION OF CONTENTS

### 1. Introduction

1. Goals.
2. General procedure.
3. Software
4. Index of terms

### 2. Schematics

1. Introduction to the schematic
2. Building symbols and libraries
3. Interconnections, properties and details
4. Errors (DRCs)
5. Netlist



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## 6. Reports

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### 3. Printed Circuit Board (PCB)

1. Introduction to the PCB
  2. Component package
  3. Making footprints and libraries.
  4. Creating the new PCB and assigning the new properties
  5. Creating the board outline
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### 4. Placement

1. Introduction to placement
  2. Basic rules
  3. Minimum distances (clearance)
  4. Non electric components
  5. Decoupling capacitors
  6. Footprint verification
  7. Applying changes (AutoECO)
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### 5. Routing

1. Introduction to routing
  2. Basic rules and parameters of the router
  3. Layers
  4. Tracks clearance
  5. Tracks width
  6. Vias
  7. Thermal relief
  8. Manual routing or autorouting
  9. Copper pours.
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### 6. Errors and clean-ups

1. Introduction
  2. Errors (DRCs)
  3. Component renaming
  4. Tiding up silk screen
  5. PCB identifier
  6. Layers identifier
  7. Fiducials
  8. Dimensions and notes
  9. Test points
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**7. Gerbers and reports**

1. Introduction.
2. Gerber formats and aperture tables.
3. Drill files.
4. Necessary reports.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Laboratory practices	60,00	100
Study and independent work	10,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	15,00	0
Preparation of practical classes and problem	60,00	0
<b>TOTAL</b>	<b>150,00</b>	

**TEACHING METHODOLOGY**

Teaching methodology will be based on practical learning. The student will have to design several complete PCB.

**EVALUATION**

Evaluation has two options.

The first option is a continuous evaluation through the whole quarter. The student will have to make three practical works (complete PCB designs) with a weight of 10% for LA1, 25% for LA2, 40% for LA3 and 25% for LAe on the 50% of the final mark of the subject. At the end of the quarter he will have a compulsory final exam (related to theory) with a weight of 50% of the mark.

The minimum mark for both parts is 5 over 10. Otherwise the student will fail the subject.

The student may use notes and books in the exam.

If the student fails the practical part he will have to do also a practical exam that will then weight the other 50%.



Attendance is compulsory and only 2 fails will be acceptable. Otherwise the student will have to make both exams to pass the subject.

In any case, the regulation established by the University of Valencia related to the evaluation process of Degrees and Master studies apply.

(<https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?idEdictoSeleccionado=5639>)

## REFERENCES

### Basic

- Printed Circuits Handbook, 7th Edition, Clyde Coombs, Happy Holden, McGraw-Hill Education
- KiCAD Documentation: [docs.kicad-pcb.org](https://docs.kicad-pcb.org)
- IPC (2005): IPC-7351 Generic Requirements for Surface Mount Design and Land Pattern Standard.

## 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 included in the Teaching Guide are maintained.

### Volume of work and temporary planning of teaching

Regarding the workload:

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

Regarding the temporary planning of teaching:

The material for the follow-up of classes allows to continue with the temporary teaching planning both in days and hours, whether or not the teaching is in the classroom.

### Teaching methodology

*If it is required by the sanitary situation, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaption to each subject, establishing the specific conditions in which it will be developed, taking into account the actual enrolment data and the space availability.*



## **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.