

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

|                      |                        |
|----------------------|------------------------|
| <b>Code</b>          | 34940                  |
| <b>Name</b>          | Industrial electronics |
| <b>Cycle</b>         | Grade                  |
| <b>ECTS Credits</b>  | 6.0                    |
| <b>Academic year</b> | 2022 - 2023            |

**Study (s)**

| <b>Degree</b>                                      | <b>Center</b>         | <b>Acad. Period</b> |
|----------------------------------------------------|-----------------------|---------------------|
| 1404 - Degree in Industrial Electronic Engineering | School of Engineering | 4 First term        |

**Subject-matter**

| <b>Degree</b>                                      | <b>Subject-matter</b>  | <b>Character</b> |
|----------------------------------------------------|------------------------|------------------|
| 1404 - Degree in Industrial Electronic Engineering | 17 - Power electronics | Obligatory       |

**Coordination**

| <b>Name</b>           | <b>Department</b>            |
|-----------------------|------------------------------|
| MASET SANCHO, ENRIQUE | 242 - Electronic Engineering |

**SUMMARY**

This course is compulsory and is provided in the first semester of the fourth year of the degree in Industrial Electronics Engineering. The total workload is 6 ECTS credits distributed in 3 theoretical credits, 1-credit problems and 2 credits of laboratory.

This course together with the so-called subject Power Electronics (3th year) forms the power electronics field.

It is a subject to be provided, to the student, an overview and practical applications of power electronics. Each application of power electronics or set of related applications is presented as a thematic unit and within each unit is introduced industrial application (specifications, status and trends), analyzing the power converters from the point of view of the application Industrial where used.



## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

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

### Other requirements

The background needed for the subject is acquired in previous courses of the degree. As is a subject that covers a particular discipline of electronics, electronic subsystems in industry application are analyzed from the knowledge of basic analogue electronic devices, the fundamentals of electrical network theory, basic skills of electronic control. But fundamentally they need is the knowledges acquired in Power Electronic module. Therefore it does not recommend academically to the students who havent att

## COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

### 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.
- CE4 - Applied knowledge of power electronics.

## LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

This subject allows to obtain the following results of learning:

- Provide a wide overview of the numerous fields of Power Electronics application (CG3, CG4, CG6 and CE4).
- Understand and analyse the operation of the switching converters in his different fields of application (CG3, CG6 and CE4).

This subject allows to obtain the following results of learning:

- Learn the handle of computer programs for the simulation and design of systems and subsystems of power.



## DESCRIPTION OF CONTENTS

### 1. Introduction

Introduction. Technological evolution. Classification.

### 2. Electronic Systems for motor drivers.

Electric motor drives: AC and DC drives. Choppers and single and three phase inverters.

### 3. Electric Utility Applications.

High-voltage DC Power Transmission (HVDC).

Interconnection of renewable energy sources (wind turbines, solar panels).

Improved power quality: static reactive power compensation, active filters, and power factor correction.

### 4. Transportation Electronic Systems

Traction in electric and hybrid vehicles.

### 5. Power Supply Applications.

DC/DC Power supplies with galvanic isolation.

Uninterruptible Power Supply (UPS).

### 6. Industrial Electronics Laboratory.

Experimental development of different prototypes of power converters:

- Chopper Class E: DC motor

- Single and Three-Phase inverter. Modulation techniques.

- Power factor correction.

- Isolated switch-mode power supplies.

**WORKLOAD**

| ACTIVITY                                     | Hours         | % To be attended |
|----------------------------------------------|---------------|------------------|
| Theory classes                               | 30,00         | 100              |
| Laboratory practices                         | 20,00         | 100              |
| Classroom practices                          | 10,00         | 100              |
| Development of individual work               | 10,00         | 0                |
| Study and independent work                   | 30,00         | 0                |
| Preparing lectures                           | 20,00         | 0                |
| Preparation of practical classes and problem | 15,00         | 0                |
| Resolution of case studies                   | 15,00         | 0                |
| <b>TOTAL</b>                                 | <b>150,00</b> |                  |

**TEACHING METHODOLOGY**

The methodology to employ in the education of this subject develops mainly under the following concepts:

**Theory sessions:** it understands like Classes of theory the time that passes, usually in a classroom, between the professor and the group of students developing theoretical concepts. During these classes will expose the theoretical foundations that it states the subject, employing different methods that can change in function of the didactic unit (CG3, CG6 and CE4).

**Exercises sessions:** it understands like exercises classes the time that passes, usually in a classroom, between the professor and the group of students resolving practical exercises. During these classes the students will resolve questions and practical problems with the assistance of the professors. The exchange of ideas between students and interventions is encouraged by proposing common corrections (CG4, CG6 and CE4).

**Laboratory sessions:** it understands like Classes of laboratory the time that passes in a classroom of laboratory. During these classes the students have of tools of software and electronic material to verify of experimental way the theoretical concepts, as well as the possibility to confirm also the solutions of the exercises (CG3, CG4, CG6 and CE4).



**Student's homework:** Preparation of the classes, resolution of problems, preparation of works, previous preparation of the sessions of laboratory and preparation of reports

- **Preparation of the classes:** Refers to the individual study to be done by the student before and / or after attending class, as instructed by the teacher. That way he prepares to understand what is going to be explained in it, and to be able to ask questions throughout that class (CG3, CE4).
- **Troubleshooting:** Time used by the student to perform some of the problems proposed by the professor. Some of these problems will be discussed in face-to-face problems sessions (CG4, CG6 and CE4).
- **Preparation of works:** Time that employs the student to make individual works or in-group proposed by the professor (CG3, CG4, CG6 and CE4).
- **Preparation of laboratory sessions and lab-reports:** It corresponds to the time that the students dedicate to understand the practice that they realized in the laboratory, delivering when appropriate, a previous questionnaire. It also includes the time devoted to the report of laboratory practices, once completed (CG3, CG4, CG6 and CE4).

## Tutorials

The tutorial have a double aim, by a part, have to serve fundamentally so that the students orient adequately his method of study and, on the other hand, the professor have a feedback method to check the efficiency of the educational method. Also the tutorial will serve for clarify of personalised way doubts of technical character related with any part of the subject. The tutorial will be so much face-to-face as no face-to-face through the platform web “classroom-virtual” (CG4 and CE4).

## EVALUATION

The examination has two different ways:

- Procedure A: The continuous evaluation of the results of learning along the entire course.
- Procedure B: The final evaluation, in second announcement, by means of an exam.

Procedure A:

CONTINUOUS EVALUATION OF THEORY-PROBLEMS (CG3, CG4, CG6 and CE4). The part of theory-problems evaluates of continuous way whit a weight of 60% for the total course score. They consist in two types of verifications: EXAM and HOMEWORKS.

- T-P EXAM (40% of the final course score): Individual exam. This activity is recoverable in the second



announcement.

- **HOMEWORKS** (20% of the final course score): it contains works/face-to-face problems and no face-to-face, in-group like individual. This homework's will take for the final qualifications whenever of individual way obtains a score higher or equal to 5 over 10. The works delivered out of the term established will not be considered for the final score. This activity is not recoverable in the second announcement.

#### EVALUATION OF THE LABORATORY (CG3, CG4, CG6 and CE4).

The evaluation of the laboratory sessions will make of continuous way, whit a weight of 40% for the total course score. The continuous evaluation has two parts:

- A 20 % corresponds to the laboratory reports.
- A 20 % corresponds to an individual laboratory final exam.

The corresponding qualification to the laboratory reports will be the arithmetical average of the qualifications obtained in each report, considering only the reports that obtain a qualification of at least 4 points over 10. This activity is not recoverable in the second announcement.

The assistance to the practices of laboratory is compulsory and necessary to be able to pass the subject. Being the assistance to the laboratory a no recoverable activity. It considers that the student has fulfilled said activity if it has assisted a minimum of 80% of the hours of this activity and has justified adequately the impossibility to assist to the remaining sessions by the concurrence of a cause of main force.

The student evaluated in a continuous procedure that don't have pass the subject, will be able to recover, in the final exam of the second announcement, the corresponding qualification of the T-P EXAM (40 % of the final course score) and the LABORATORY FINAL TEST (20 % of the final course score).

The final grade of the subject will be the average among of the different qualifications, for which will be necessary obtain a minimal note of 5 on 10 at the examination of the theory-problems part, at the laboratory tasks and at the individual final laboratory examination.

Procedure B: EVALUATION BY FINAL EXAMINATION in second announcement (CG3, CG4, CG6 and CE4).

For those students that have not followed the continuous evaluation, have of a method of evaluation in



second announcement based in:

- Final Exam of Theory-Problems (40% of the total course score)
- Final Exam of Laboratory (20% of the total course score)
- Practical implementation at the Laboratory (40% of the total course score)

To be able to pass the subject by means of the final exam, will have to obtain a score of 5 over 10 in each of the three individual verifications.

In any case, the system of evaluation will govern by the established in the Regulation of Evaluation and Qualification of the University of València for Degrees and Masters.

(<https://webges.uv.es/uvtaeweb/muestrainformacionedictopublicofrontaction.do?idedictoseleccionado=5639>)

## REFERENCES

### Basic

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#### **Additional**

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- Eduard Ballester, Robert Piqué: Electrónica de potencia : principios fundamentales y estructuras básicas. Marcombo, 2011 ISBN:9788426716699