COURSE DATA

DATA SUBJECT

Code: 34933
Name: Electrical technology / electrotechnics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1404 - Degree in Industrial Electronic Engineering	Escola Tècnica Superior d'Enginyeria	2	First quarter, Sin determinar

SUBJECT-MATTER

Degree	Subject-matter	Character
1404 - Degree in Industrial Electronic Engineering	Electrotechnics	COMPULSORY

COORDINATION

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SUMMARY

This is a mandatory course taught in the first semester of the second year of the degree of Bachelor in Industrial Electronics Engineering. The total teaching load is 6 ECTS. The workload for the student is 150 hours over the semester, 60 of which correspond to classroom lectures and 90 correspond to home assignments.

This subject is part of the matter Electrical Technology together with the subject Electrical Machines. This is a subject that should provide the student with a global vision and practice of electricity as a source of energy available by the end user and the management and use of energy according to the established legal standards.

This course addresses the basic principles of generation, distribution and management of electric power. It will give the student the knowledge and application of technical concepts that apply to electrical installations in medium and low voltage. It will also provide students with the necessary general knowledge and methods for solving engineering problems.

The basic contents of the subject are:

- Generation and distribution of electricity.
- Transformation centers.
- Low voltage switchgear.
- Ground connections.
- Protection of people against direct and indirect contacts with the grid.

- Busbar.
- Facility protections against overcurrent and overvoltage.
- Lighting systems.
- Rates and reactive power compensation.

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 the subjects of mathematics taught in first and second semester. This knowledge includes calculations with complex numbers, Laplace transform and Fourier analysis. Other essential contents necessary to successfully pass the course are the electric circuits theory and to a lesser extent basic analogue electronics.

COMPETENCES / LEARNING OUTCOMES

1404 - Degree in Industrial Electronic Engineering

CE1 - Applied knowledge of electrical 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.

DESCRIPTION OF CONTENTS

Presentation.
Calendar.
Introduction.
Structure of an electrical system.
Hydroelectric power plant.
Conventional thermal power plants.
Nuclear power plants.
Renewable energy plants.

1. Power generation systems

Presentation.
Calendar.
Introduction.
Structure of an electrical system.
Cogeneration.

Review the concepts of single and three phase alternating current.
Electrical power.
Elements involved in the transport and distribution of electricity.
Symbology.
Transformer.
Distribution networks.
Parameters of the power lines.

Introduction. Definitions and Magnitudes.
Circuit Breakers.
Small circuit breakers.
Fuses.
Contactors.
Differential switches and relays.

Introduction.
Structure of insulated cables.
Applications of cables.
Electrical parameters of the conductors.
Voltage drop in conductors.
Heating of the conductors.
Baseline data for conductor sizing.
Sizing of conductors.

Introduction.
Overload protection.
Short circuit protection.
Calculation of short circuit currents in low voltage installations.
Selection of devices for protection against short circuits.
Overvoltage protection.

Introduction.
Characterization parameters of a ground connection.

2. Transport and distribution of electricity

Review the concepts of single and three phase alternating current.
Electrical power.
Elements involved in the transport and distribution of electricity.
Symbology.

3. Low voltage switchgear

Introduction. Definitions and Magnitudes.
Circuit Breakers.
Small circuit breakers.

4. Electrical Raceways

Introduction.
Structure of insulated cables.
Applications of cables.
Electrical parameters of the conductors.

5. Overload and short circuit protection

Introduction.
Overload protection.
Short circuit protection.

6. Ground connections

Introduction.
Purpose of grounding electrical systems.
Distribution patterns at low voltage.
Calculation of resistance of a grounding connection.

Introduction.
Danger of electric current.
Concept of direct and indirect contact to the hot line.
Protection against direct contact.
Protection against indirect contact.
System protections against indirect contacts based on power failure.
Other system protections against indirect contacts without cutting the power.

Introduction.
Need for compensation.
Forms of compensation.
Reactive power demand of different consumer items.
Calculation of reactive power to compensate.

7. Protection against direct and indirect contacts to hot lines

Introduction.
Danger of electric current.
Concept of direct and indirect contact to the hot line.
Protection against direct contact.

8. Power Quality. Reactive power compensation in low voltage installations

Introduction.
Need for compensation.
Forms of compensation.Determination and calculation of the capacitors to be used.
Automatic adjustment of reactive power.

Transformer substation.
Introduction.
Open-air transformer substation.
Indoor transformer substations.
Design of pipelines.
Switchgear and equipment of a transformer substation.

Introduction.
Quantities and units.
Elements of lighting installations.
Types of lamps.
Facility Design.
Lighting.
Lighting and energy saving.

Calculation of transformer substation.
Switchgear installation.
Grounding scheme.
Protections.
Type and size of the wiring.

Introduction.
Structure and actors in the market.
Qualified consumers.
Consumers to rate.
Rights and obligations of consumers

9. Transformer substation

Transformer substation.
Introduction.
Open-air transformer substation.

10. Industrial and residential electricity. Lighting

Introduction.
Quantities and units.
Elements of lighting installations.
Types of lamps.

11. Design example of a facility

Calculation of transformer substation.
Switchgear installation.
Grounding scheme.

12. Legal Framework. Procurement of electricity

Introduction.
Structure and actors in the market.
Qualified consumers.

13. Electrical Technology Lab

- Software tools. AC measurements and instrumentation.
- Simulations of lines, and transient protection.
- Energy, power and power factor measurements. Power factor correction.
- Real life applications
- Low voltage systems. Grounding method.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	25,00
Laboratory	15,00
Classroom practices	20,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00

Individual or group project	10,00
Independent study and work	20,00
Preparation of lessons	25,00
Preparation for assessment activities	35,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

Class work: Theory, exercises and laboratory.
Theory means the amount of time the teacher meets the students to develop theoretical concepts. During these classes the teacher will introduce the theoretical concepts using different methods that can change depending on the unit. (CG3, CG6, CE1)
Exercises means the amount of time the teacher and students solve practical problems. During these classes students will solve practical problems and issues with the assistance of teachers. They promote the exchange of ideas between students and the common search for solutions. (CG4, CG6, CE1)
Classes are understood as the time spent in the lab. During these classes students have software tools and electrical equipment to verify experimentally the theoretical concepts as well as the opportunity to confirm the solutions of the problems. (CG4, CG6, CE1)

Student's homework: Preparation of classes, problem solving, job preparation, prior preparation of the laboratory sessions and reporting.
Preparation of Class: Refers to the individual study to be carried out prior to the classes to understand what is going to be explained in the class and prepare questions.
Troubleshooting: Time used by the student to perform some of the exercises proposed by the teacher. Some of these exercises will be discussed in the class.
Preparation of work assignment: time used by the student for individual and group work proposed by the teacher.
Preparation of the lab sessions and reports of the lab sessions: It is the time that students devote to understanding the lab assignments. It also includes the time taken to make the report of work done in the previous lab session.
During the homework activities the student develops all the competences of the subject (CG3, CG4, CG6, CE1)
Tutorials.
The tutorial is twofold, firstly, it should serve primarily for students to plan its method of study and, moreover, the teacher has a feedback method to test the effectiveness of the educational method. Tutorials also serve to clarify technical questions related to any part of the course.

EVALUATION

ASSESSMENT IN 1ST AND 2ND SEASON EXAMS
- EXAM on Theory, Problems, and Laboratory questions, worth 90% of the final grade. To be offset against the remaining assessable sections, the exam grade must be greater than or equal to 5.
- ASSESSMENT OF THE IN-PERSON LABORATORY SECTION (10% of the final grade). The grade will be the weighted average of the practical sessions for which a study or report was required.
Attendance at laboratory sessions is mandatory, and to be able to add the grade from the practical sessions to the final grade for the course, students must attend at least 80% of the practical sessions and obtain a minimum grade of 4 on the reports. In-person laboratory sessions are considered non-recoverable.
To pass the course, the total weighted average for the subject must be greater than or equal to 5 out of 10. These assessment tests assess all the competencies of the subject
In any case, the assessment system will be governed by the provisions of the document: Assessment and

Qualification Regulations of the University of Valencia for Degrees and Master's Degrees. (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.doaccion=inicio&idEdictoSeleccionado=5639). The blatant copying or plagiarism of any activity that is part of the assessment will result in the inability to pass the subject, and the student will then be subject to the appropriate disciplinary procedures indicated in the PROTOCOL FOR ACTION IN THE FACE OF FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

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