



TECHNICAL SHEET OF THE SUBJECT

Data of the subject

Subject name	Instalaciones de Media y Baja Tensión
Subject code	DIE-MII-633
Involved programs	Máster Universitario en Ingeniería Industrial [Second year]
Credits	4,5 ECTS
Type	Obligatoria
Department	Department of Electrical Engineering

Teacher Information

Teacher

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Competencies - Objectives

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

Chapter1: Low Voltage and Medium Voltage Electrical Network

1. Electrical Network architecture. Concepts. Graphical Representation and Symbols. LV and MV design criteria. Definition and sizing of Power Transformation Centers.
2. MV switchgear. Smart Grids. Present MV networks.
3. Cables and isolated conductors: Overview. Underground networks, maximum currents, correction factors.



4. Single and Three Phase Power distribution lines calculations. Uniform size open distribution, variable size open distribution, two-ends distribution arrangement. Ring arrangement. DC lines. Maximum installed power. Power losses.
5. LV overhead electrical installations. Access points. Joints and derivations. Clearance distances. Earthing system. Supports. Wall mounted installations.
6. LV underground networks. Access points. Joints and derivations. Earthing system. Trenches and conducts.

Chapter 2: Power Transformation Centers (PTC)

1. General Overview
2. Electrical Schemes. Standardized electrical company arrangements.
3. In door PTC arrangements. Clearing and operational distances
4. PTC cooling: Concepts, air natural, air forced, nomograph.
5. Earthing system; General concepts, elements to be connected. Safety grounding, service earth system. Interconnections. Electrical magnitudes being involved. Step Voltage, Contact voltage, and maximum applied voltages calculations. Ground resistivity. UNE-EN 50521 Method calculations. Constructive details.
6. LV and MV earth fault calculations. Isolated network, grounded network, clearance times. Short circuit overcurrents calculations. Actual installation visit.

Chapter 3: LV Installations Design.

1. Installation characteristics. Nominal voltages.
2. Service installations. Concepts. General characteristics. CGP, CGM, LGA Schemes. Measurement devices. CGPM. Voltage drop.
3. ITC-BT-18 earthing system. Concepts; Ground resistivity; Earthing resistivity.
4. ITC-BT-19 general prescriptions. Overview; conductors; circuit separation. Isolation.
5. Installation systems ITC-BT-20
6. Conducts and tubes ITC-BT-21; Characteristics; Installation; Overcurrent protection. LV switchgear. Basic functions. General characteristics and classification. Nominal parameters for protection, operation and control devices.

Chapter 4: Indoor Installations.

1. Electrical consumers. Illumination, heating, motors, transformers, reactances and capacitors.
2. Installed capacity. Concepts. Estimates. Simultaneity factors.
3. Home installations. Protections. General Protection; circuits, connection points; installation mounting; Special installations (baths, etc.)
4. Electrical Vehicle charging points; definitions; type of connections; schemes. General prescriptions and standards.
5. Electrical network disturbances. Harmonics.
6. Domotics.

Chapter 5: Illumination

1. Outdoor illuminations: REE 2008; Road and rail illumination. Methods.
2. Illumination installations ITC-BT-09: Requisites, service connections; circuit protections; illumination networks. Earthing system.
3. Energy efficiency: Outdoor illumination.
4. New technologies for outdoor illumination.

Chapter 6: Photovoltaic Installations for consumers.

1. General overview
2. Present standards and regulation. RD-15-2018



3. Technical conditions. Installation configuration. Protections. Operation and maintenance.

TEACHING METHODOLOGY

General methodological aspects of the subject

In order to achieve the proposed competency development, both face-to-face and online sessions will encourage the active involvement of students in learning activities.

Face-to-Face Methodology: Activities

Lecture-based lesson: Presentation of the main concepts and procedures through the teacher's explanation. It will include dynamic presentations, small practical examples, and regulated or spontaneous student participation. Prior to theoretical sessions, short tests may be conducted to assess students' independent work.

In-class problem solving: Solving key problems to help students understand the context. The resolution will be carried out cooperatively by the teacher and students.

Tutorials: Conducted in groups or individually to address students' questions after working on different topics. They will also guide students in their learning process.

Online Methodology: Activities

Review of class materials: Individual activity where the student reviews and completes what was covered in class.

Individual study of materials to be discussed in future classes: Students individually analyze, search for, and internalize information related to the subject, which will later be discussed with peers and the teacher.

Study of theoretical material not presented in class: Some topics will be studied independently by the student without a theoretical presentation. Problems and individual or group activities will be assigned and later discussed in class to ensure proper understanding.

Solving problems outside class hours: Students must apply and internalize the knowledge acquired. Corrections will be done with the whole class, either by students or the teacher depending on the case. Individual corrections will be done by the student or a peer (peer review method).

Group work: Work groups will be formed to carry out tasks outside class hours, requiring members to share information and resources to achieve a common goal.

EVALUATION AND CRITERIA

Quarterly exam	Test	40
Electrical Installation Project	Global Qualification composed by: • Project documentation (40%) • Tutorial checking (30%) • Individual enquiry (30%)	50



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Test

Individual checking should be made along the course by quick question test

10

Ratings

Ordinary Call

Final grade = 40% Final exam + 10% Continuous assessment tests + 50% Group work

Extraordinary Call

Final grade = 75% Written exam + 25% Group work

In both calls, the weighted average will only be calculated if both the average exam grade and the average group project grade are equal to or higher than 5.

Failure to attend more than 15% of classes may result in the loss of the right to sit the exam in the ordinary call (and even in the extraordinary call) for the subject (Article 93.3 of the General Regulations, and Articles 7.2 and 7.3 of the Academic Rules).

Use of AI in Assessment Activities

In the project, AI may be used as a source of information. Its use must be properly cited, and sources must be independently verified by the student.

In all other assessment activities, the use of AI is strictly prohibited.

WORK PLAN AND SCHEDULE

Activities			Date of realization	Delivery date
Electrical Installation Project	First 12 weeks	Week 12		
Chapter 1 and work presentation	Weeks 1 and 2			
Chapter 2 and work tutorials	Weeks 3 and 4			
Chapter 3 and work tutorials	Weeks 5 and 6			
Chapter 4 and work tutorials	Weeks 7 and 8			



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Chapter 5 and work tutorials	Weeks 9 and 10		
Chapter 6 and work tutorials	Weeks 11 and 12		
Completion of the work	Week 13		
Individual questions of the work	Week 14		

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

Rules and Regulations

Technical Guide for the Application of the REBT

MIE-RAT (Electrotechnical Instructions for High Voltage Installations)

RAT (Regulation on Technical Conditions and Safety in High Voltage Installations)

REBT (Regulation on Electrotechnical Conditions for Low Voltage Installations)

Complementary Bibliography

Web Bibliography

- <http://www.ormazabal.es> Fabricante de casetas prefabricadas.
- <http://www.trefilcable.es> Fabricante de conductores aéreos.
- <http://www.generalcable.es> Fabricante de conductores subterráneos.
- <http://www.eng.aiz.ru/index/> Fabricante de aisladores.
- <http://www.endesa.es/Portal/es/proveedores/default.htm> Portal de la compañía Endesa.
- <https://www.mesa.es/es/categoria/fusibles-de-mt>: Mesa es fabricante de fusibles de media tensión
- <http://www.grupotemper.com/downloads/crady.pdf>; <http://www.grupotemper.com/downloads/tarifa-2015/Tarifa-Temper-2015-Cap01.pdf> Catálogos de fusibles de baja tensión
- <https://www.lighting.philips.es/prof>: Catálogo de iluminación de Philips
- <https://www.se.com/es/es/all-products/>: Catálogos de productos de Schneider
- <https://www.i-de.es/gestiones-online-soporte/conexion-productores/documentacion-tecnica>: documentación de IBERDROLA