

Course guide

340107 - INEL-E6009 - Low, Medium and High Voltage Electrical Installations

Last modified: 17/05/2023

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Ramon Caumons Sangrà

Others: Ramon Caumons Sangrà

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. CE21. Ability to design and calculate electrical installations of low or middle tension.
2. CE22. Ability to design and calculate electrical installations of high tension.

Transversal:

3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.
4. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.

TEACHING METHODOLOGY

- In the lectures will be presented and developed the theoretical foundations of programmed materials. Consist of theoretical explanations complemented by activities to encourage participation, discussion and critical analysis by students.
- In the kinds of problems were raised and solved exercises for the areas covered. Students have to solve, individually or in groups, indicating problems.
- Within hours of laboratory practice, students will take the required and delivered its report of the activity along with appropriate calculations and critical considerations.
- It will realised group work during the year related to a specific topic of the course.

LEARNING OBJECTIVES OF THE SUBJECT

- Design of protections for teams and individuals in systems and wiring.
- Analysis of the different types of neutral connection in the systems and facilities power.
- Selecting the necessary switchgear and electrical systems
- Design of electrical installations.
- Calculation of earthing electrical installations.
- Sizing of processing centers.
- Using the rules and regulations in electricity projects.
- Selecting the most appropriate security system to protect people and equipment.
- Use tools to calculate and electrical systems.



STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Hours large group	45,0	30.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

(ENG) TEMA 1:ELECTRICAL SWITCHGEAR

Description:

Switchgear: definition, function and classification.
Characteristic values.
Problems of electrical switchgear.
Overview of switches.
Breaking techniques.
Breakers: definitions and specifications.
Fuses: definitions and specifications.
Section: Definitions and specifications.
Contactors: definitions and specifications.
LV switchgear for maneuver.

Full-or-part-time: 25h

Theory classes: 7h 30m

Laboratory classes: 2h 30m

Self study : 15h

(ENG) TEMA2:SYSTEM OF NEUTRAL AND PROTECTION OF THE PEOPLE

Description:

Importance of neutral treatment of electrical systems.
Types neutral connections.
Grounding transformers.
LV distribution schemes.
Introduction to the protection of individuals. The 5 golden rules.
Classification of electrical accidents.
Human body's sensitivity to the passage of electrical current. Physiological effects.
Protection against direct and indirect contacts.
The circuit breaker.
The field and conductor.
Measurement of ground resistivity and resistance of grounding.
Ground at low voltage. Usual electrodes

Full-or-part-time: 25h

Theory classes: 7h 30m

Laboratory classes: 2h 30m

Self study : 15h

(ENG) TEMA 3: INSTALLATION AND PROTECTION OF ELECTRICAL SYSTEMS

Description:

General.
Nature and cause of faults.
Essential qualities required for the protection of electrical systems.
Elements of a protection system.
Introduction to transformers of measure.
Relays: types.
Selectivity.
Protection of low voltage installations.
Calculation of sections. Design criteria.
Regulations.

Full-or-part-time: 25h

Theory classes: 7h 30m

Laboratory classes: 2h 30m

Self study : 15h

(ENG) TEMA 4: ISOLATION AND COORDINATION OF SURGE PROTECTION

Description:

Surges. Origin and classification.
Introduction to the coordination of insulation: voltage-time curve.
Surge Protection: Lightning.
Ground wires.
BT surge protection.

Full-or-part-time: 25h

Theory classes: 7h 30m

Laboratory classes: 2h 30m

Self study : 15h

(ENG) TEMA 5: CENTRES OF TRANSFORMATION

Description:

Definitions and classification.
Draft a transformer.
Power and distribution transformers. Selection criteria.
Transformer protection.
Schemes. Prefabricated cabins.
Overview of low voltage.
Short circuit currents, ventilation, protection against surges and fire.
Purpose of the ground.
Establishment of a ground facility.
Classification grounded.
Potential gradient. Step voltages and contact information.
Introduction to the proposed grounding installations.

Full-or-part-time: 25h

Theory classes: 7h 30m

Laboratory classes: 2h 30m

Self study : 15h



(ENG) TEMA 6: POWER PLANT PROJECT

Description:

General. Classification of electrical installations.
Standards and regulations.
Parts of a low voltage electrical installation
Type of low voltage supplies.
Load forecasting. Coefficients of simultaneity.
The power project. Methodology.

Full-or-part-time: 25h

Theory classes: 7h 30m

Laboratory classes: 2h 30m

Self study : 15h

(ENG) PRACTICES

Description:

- 1 .- switchgear protection.
- 2 - Design and facility security. (Using spreadsheet software).
- 3 .- Design of substations (Using spreadsheet software).
- 4 .- Verification of the electrical (insulation resistance, earth ...)

GRADING SYSTEM

70 % theory

30 % practices.

REEVALUATION:

The reevaluation part of the subject corresponds to the exams (70%).

It will be carried out according to the regulations of the EPSEVG.

EXAMINATION RULES.

- The written tests are classroom and individual.
- In classes of problems and / or laboratory practices will be assessed, where appropriate, previ work together with presentation of results of the activity.

BIBLIOGRAPHY

Basic:

- Espanya. Ministerio de Industria, Turismo y Comercio. RLAT, reglamento de líneas eléctricas de alta tensión : instrucciones técnicas complementarias ITC-LAT 01 a 09 y guía técnica de aplicación, guía LAT-05 : Real Decreto 223/2008 de 15 de febrero. 2a ed. Madrid: Garceta, 2011. ISBN 9788492812783.
- Conte, Gaetano. Impianti elettrici. 5a ed. Milano: Ulrico Hoepli, 1992. ISBN 9788820335557, 9788820338466.
- Instalaciones eléctricas. 2a ed. Berlin [etc.]: Siemens Aktiengesellschaft, 1989.
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- Lazar, Irwin. Análisis y diseño de sistemas eléctricos para plantas industriales. México D.F. [etc.]: Noriega Editores : Limusa, 1988. ISBN 9681819608.
- García Márquez, Rogelio. La Puesta a tierra de instalaciones eléctricas y el R.A.T. Barcelona: Marcombo Boixareu, 1991. ISBN 8426707998.
- Davies, T. Protection of industrial power systems [on line]. 2nd ed. Oxford [etc.]: Newnes, 1996 [Consultation: 20/02/2024]. Available on : <https://www.sciencedirect-com.recursos.biblioteca.upc.edu/book/9780750626620/protection-of-industrial-power-systems>. ISBN 0750626623.
- Wadhwa, C.L. Electrical power systems [on line]. 2nd ed. New York [etc.]: Wiley, 1991 [Consultation: 14/02/2024]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pg-origsite=primo&docID=3382455>. ISBN 0470218088.
- Barrero, Fermín. Sistemas de energía eléctrica. Madrid: Thomson, 2004. ISBN 8479322835.