

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

Coordinating unit:	340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit:	709 - EE - Department of Electrical Engineering
Academic year:	2018
Degree:	BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits:	6
Teaching languages:	Catalan

### Teaching staff

Coordinator:	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.

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

- Use tools to calculate and electrical systems.

### Study load

Total learning time: 150h	Hours large group:	45h	30.00%
	Hours medium group:	0h	0.00%
	Hours small group:	15h	10.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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

### Content

<p>(ENG) TEMA 1:ELECTRICAL SWITCHGEAR</p>	<p>Learning time: 25h Theory classes: 7h 30m Laboratory classes: 2h 30m Self study : 15h</p>
<p>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.</p>	
<p>(ENG) TEMA2:SYSTEM OF NEUTRAL AND PROTECTION OF THE PEOPLE</p>	<p>Learning time: 25h Theory classes: 7h 30m Laboratory classes: 2h 30m Self study : 15h</p>
<p>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</p>	

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

<p>(ENG) TEMA 3: INSTALLATION AND PROTECTION OF ELECTRICAL SYSTEMS</p>	<p>Learning time: 25h Theory classes: 7h 30m Laboratory classes: 2h 30m Self study : 15h</p>
<p>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.</p>	
<p>(ENG) TEMA 4: ISOLATION AND COORDINATION OF SURGE PROTECTION</p>	<p>Learning time: 25h Theory classes: 7h 30m Laboratory classes: 2h 30m Self study : 15h</p>
<p>Description: Surges. Origin and classification. Introduction to the coordination of insulation: voltage-time curve. Surge Protection: Lightning. Ground wires. BT surge protection.</p>	

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

<p>(ENG) TEMA 5: CENTRES OF TRANSFORMATION</p>	<p>Learning time: 25h Theory classes: 7h 30m Laboratory classes: 2h 30m Self study : 15h</p>
<p>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.</p>	
<p>(ENG) TEMA 6: POWER PLANT PROJECT</p>	<p>Learning time: 25h Theory classes: 7h 30m Laboratory classes: 2h 30m Self study : 15h</p>
<p>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.</p>	
<p>(ENG) PRACTICES</p>	
<p>Degree competences to which the content contributes: 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 ...)</p>	

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

### Qualification system

70 % theory  
30 % practices.

#### REEVALUATION:

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

According to EPSEVG regulations:

- The reevaluation will be possible if the subject with a final grade equal to or greater than 3.0 has been suspended.
- The final grade of the subject after the reevaluation will have a maximum value of 5.0.

### Regulations for carrying out activities

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

### Bibliography

#### Basic:

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Montané Sangrà, Paulino. Protecciones en las instalaciones eléctricas : evolución y perspectivas. 2a ed. Marcombo Boixareu, 1990. ISBN 8426706886.

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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. 2nd ed. Oxford [etc.]: Newnes, 1996. ISBN 0750626623.

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Barrero, Fermín. Sistemas de energía eléctrica. Madrid: Thomson, 2004. ISBN 8479322835.

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