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

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h</th>
<th>30.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
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<tr>
<td></td>
<td>Hours small group: 15h</td>
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<td>Guided activities: 0h</td>
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<td></td>
<td>Self study: 90h</td>
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<tr>
<td>(ENG) TEMA 1: ELECTRICAL SWITCHGEAR</td>
<td>Learning time: 25h</td>
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<td>----------------------------------</td>
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<td></td>
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<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 7h 30m</td>
<td></td>
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<tr>
<td>Switchgear: definition, function and classification.</td>
<td>Laboratory classes: 2h 30m</td>
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<tr>
<td>Characteristic values.</td>
<td>Self study: 15h</td>
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<tr>
<td>Problems of electrical switchgear.</td>
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<tr>
<td>Overview of switches.</td>
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<tr>
<td>Breaking techniques.</td>
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<tr>
<td>Breakers: definitions and specifications.</td>
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<tr>
<td>Fuses: definitions and specifications.</td>
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<tr>
<td>Section: Definitions and specifications.</td>
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<tr>
<td>Contactors: definitions and specifications.</td>
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<tr>
<td>LV switchgear for maneuver.</td>
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</table>

<table>
<thead>
<tr>
<th>(ENG) TEMA 2: SYSTEM OF NEUTRAL AND PROTECTION OF THE PEOPLE</th>
<th>Learning time: 25h</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 7h 30m</td>
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<tr>
<td>Importance of neutral treatment of electrical systems.</td>
<td>Laboratory classes: 2h 30m</td>
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<tr>
<td>Types neutral connections.</td>
<td>Self study: 15h</td>
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<tr>
<td>Grounding transformers.</td>
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<tr>
<td>LV distribution schemes.</td>
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<tr>
<td>Introduction to the protection of individuals. The 5 golden rules.</td>
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<tr>
<td>Classification of electrical accidents.</td>
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<tr>
<td>Human body's sensitivity to the passage of electrical current. Physiological effects.</td>
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<tr>
<td>Protection against direct and indirect contacts.</td>
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<td>The circuit breaker.</td>
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<tr>
<td>The field and conductor.</td>
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<tr>
<td>Measurement of ground resistivity and resistance of grounding.</td>
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<tr>
<td>Ground at low voltage. Usual electrodes</td>
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</tbody>
</table>
### (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.

**Learning time:** 25h

- Theory classes: 7h 30m
- Laboratory classes: 2h 30m
- Self study: 15h

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

**Description:**
- Introduction to the coordination of insulation: voltage-time curve.
- Surge Protection: Lightning.
- Ground wires.
- BT surge protection.

**Learning time:** 25h

- Theory classes: 7h 30m
- Laboratory classes: 2h 30m
- Self study: 15h
# 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.

**Learning time:** 25h
- Theory classes: 7h 30m
- Laboratory classes: 2h 30m
- Self study: 15h

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# 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.

**Learning time:** 25h
- Theory classes: 7h 30m
- Laboratory classes: 2h 30m
- Self study: 15h

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# PRACTICES

**Degree competences to which the content contributes:**
- 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 ...)

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Last update: 08-04-2015
Qualification system

70 % theory
30 % works

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, prior work together with presentation of results of the activity.

Bibliography

Basic:


