

## Syllabus

### Course description

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|--------------------------|--------------------------------|
| <b>Course title</b>      | Electrical Systems Engineering |
| <b>Course code</b>       | 45500                          |
| <b>Scientific sector</b> | ING IND/33                     |
| <b>Degree</b>            | LM – 30                        |
| <b>Semester</b>          | 1                              |
| <b>Year</b>              | 2018                           |
| <b>Academic Year</b>     | 2018-2019                      |
| <b>Credits</b>           | 6                              |
| <b>Modular</b>           | No                             |

|                              |   |
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| <b>Total lecturing hours</b> | 60  |
| <b>Total lab hours</b>       | 0   |
| <b>Total exercise hours</b>  | 0   |
| <b>Attendance</b>            | Not mandatory   |
| <b>Prerequisites</b>         | Mathematical analysis, Physics 2, Electrotechnics   |
| <b>Course page</b>           | <a href="https://www.esse3.unitn.it/Guide/PaginaADContest.do?ad_cont_id=10437*91590*2018*2016*9999">https://www.esse3.unitn.it/Guide/PaginaADContest.do?ad_cont_id=10437*91590*2018*2016*9999</a> |

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| <b>Specific educational objectives</b> |  |
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| <b>Lecturer</b>                          | Dr Emanuele Fornasiero  |
| <b>Scientific sector of the lecturer</b> | ING-IND/32  |
| <b>Teaching language</b>                 | English   |
| <b>Office hours</b>                      | Appointment by email  |
| <b>Teaching assistant (if any )</b>      |   |
| <b>Office hours</b>                      |   |
| <b>List of topics covered</b>            | <ol style="list-style-type: none"> <li>1. Definitions and generality</li> <li>2. Sinusoidal quantities</li> <li>3. Three-phase systems</li> <li>4. Networks structure</li> <li>5. Sizing of continuous and alternating power lines</li> <li>6. Transformers</li> <li>7. Non-symmetrical electrical networks</li> <li>8. Fault analysis</li> <li>9. Electrical safety</li> </ol> <p>Initially the course refers to elements of general electrotechnics. Then the symbolic notation is introduced for the study of sinusoidal networks: complex operators; behavior of the bipoles in sinusoidal and three-phase systems.</p> |

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|  | <p>The emphasis is on electrical installations; structure of the Italian electricity system; structure of electrical networks; generation, transmission, distribution and final use of electricity. Furthermore, the criteria for the design of DC power lines will be examined; cantilevered power lines; sizing of lines with constant section or constant current density.</p> <p>The main constructive characteristics of single-phase and three-phase transformers are therefore examined; magnetic cores and electric coils; real transformer; losses due to the Joule effect and iron losses due to hysteresis and eddy currents.</p> <p>The theory of symmetrical components for the understanding and analysis of non symmetrical three-phase electrical faults is addressed.</p> <p>Finally, the effects of electricity on the human body are examined; the components of a grounding system and protection against indirect electrical contacts.</p> |
| <p><b>Teaching format</b></p>          | <p>Class lectures</p>   |
| <p><b>Learning outcomes (ILOs)</b></p> | <p>The learning outcomes need to refer to the Dublin Descriptors:</p> <p><u>Knowledge and understanding</u></p> <p>1. Knowledge of the basics related to the distribution of electricity in medium and low voltage, criteria to design electric lines, basics on transformers, line faults and electric safety.</p> <p><u>Applying knowledge and understanding</u></p> <p>2. Students will be able to approach the design of direct current and alternating current lines, with a basic understanding on how to select the proper circuit protection. Recognize the different voltage level associated with electricity transmission and evaluate the main issues related to the distribution of electricity. A basic knowledge of CEI regulations is also provided.</p> <p><u>Making judgements</u></p> <p>3. Students will be able to interpret design choices on existing systems, and to identify and investigate critical aspects related with them.</p>   |

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|  | <p><u>Communication skills</u></p> <p>4. Students will learn the main technical terms related to the topic.</p> <p><u>Ability to learn</u></p> <p>5. The variety of topics of the course allow the students to have basic knowledge of many subjects, giving them the opportunity to easily deepen specific topics.</p> |
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| <b>Assessment</b>  | <b>Formative assessment</b>  |                         |                         |                      |
|  | <b>Form</b>  | <b>Length /duration</b> | <b>ILOs assessed</b>    |                      |
|  |  |                         |                         |                      |
|  | <b>Summative assessment</b>  |                         |                         |                      |
|  | <b>Oral examination with two or three general questions</b>  |                         |                         |                      |
|  | <b>Form</b>  | <b>%</b>                | <b>Length /duration</b> | <b>ILOs assessed</b> |
|  | Oral examination, two or three questions   | 100                     | About ½ hour            | all                  |
|  |  |                         |                         |                      |
| <b>Assessment language</b>                                 | English/italian  |                         |                         |                      |
| <b>Evaluation criteria and criteria for awarding marks</b> | A single final mark will be calculated averaging the marks of two questions. Both marks must be at least 18. |                         |                         |                      |

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| <b>Required readings</b>      | Lessons and slides of the course  |
| <b>Supplementary readings</b> | <ul style="list-style-type: none"> <li>- M. Fauri, .F. Gnesotto, G. Marchesi, A. Maschio: "Lezioni di Elettrotecnica - vol. 1 Elettrotecnica generale", Società editrice Esculapio, Bologna, 1999.</li> <li>- M. Fauri, .F. Gnesotto, G. Marchesi, A. Maschio: "Lezioni di Elettrotecnica - vol. 2 Applicazioni elettriche", Società editrice Esculapio, Bologna, 2002.</li> <li>- L. Fellin, R. Benato, Impianti elettrici, Utet Scienze Tecniche, 2011</li> </ul> |