

## Syllabus

### Course description

<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>	I
<b>Academic Year</b>	2020-2021
<b>Credits</b>	6
<b>Modular</b>	No

<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>	

<b>Specific educational objectives</b>	
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<b>Lecturer</b>	Dr Emanuele Fornasiero emanuele.fornasiero@unibz.it
<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</p>

	<p>systems.          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.          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.          The theory of symmetrical components for the understanding and analysis of non symmetrical three-phase electrical faults is addressed.          Finally, the effects of electricity on the human body are examined; the components of a grounding system and protection against indirect electrical contacts.</p>
<b>Teaching format</b>	Class lectures
<b>Learning outcomes (ILOs)</b>	<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>

	<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>	<p><b>Formative assessment</b></p> <table border="1"> <thead> <tr> <th>Form</th> <th>Length /duration</th> <th>ILOs assessed</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p><b>Summative assessment</b></p> <p><b>Oral examination with two or three general questions</b></p> <table border="1"> <thead> <tr> <th>Form</th> <th>%</th> <th>Length /duration</th> <th>ILOs assessed</th> </tr> </thead> <tbody> <tr> <td>Oral examination, two or three questions</td> <td>100</td> <td>About ½ hour</td> <td>all</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Form	Length /duration	ILOs assessed				Form	%	Length /duration	ILOs assessed	Oral examination, two or three questions	100	About ½ hour	all				
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<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. Evaluation based on knowledge of the subject and ability to do connections between the various course topics																		

<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>