Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Electrical Systems Engineering
Course code	45500
Scientific sector	ING-IND/33
Degree	Master Energy Engineering
Semester	1st
Year	1st
Academic year	2017-2018
Credits	6
Modular	

Total lecturing hours	60
Total lab hours	0
Total exercise hours	0
Attendance	Not mandatory
Prerequisites	Students attending this course should have already passed the exam of Physics II and Electrotechnics
Course page	https://www.unibz.it/en/faculties/sciencetechnology/master-energy-engineering/course-offering/?academicYear=2017

Specific educational objectives	The course will cover the following topics: 1. Structure of electrical networks 2. DC and AC electrical power lines; 3. Transformers 4. Non-symmetrical networks 5. Grid failure 6. Electrical safety 7. LV distribution systems

Module 1	
Lecturer	Maurizio Fauri
Scientific sector of the lecturer	ING-IND/33
Teaching language	English
Office hours	Appointment by email
Teaching assistant *(if any)*	
Office hours	
List of topics covered	(1) Electrotechnic and Electromagnetism: • definition of resistor, capacitor, inductor; • characteristic equation of ports; • Rms value of a sinusoidal magnitude; • behaviour of dipoles in sinusoidal condition. • magnetic properties of materials; • magnetic circuits.

	(2) Sinusoidal networks: • symbolic notation; • complex operators; • behaviour of dipoles in sinusoidal condition and three-phase systems. (3) Electrical installations: • structure of the Italian electricity system; • structure of power networks; • generation; • transmission; • distribution; • final use of electrical energy. (4) Criteria to design power lines: • designing criteria; • DC and AC cantilever lines; • dimensioning in constant section or at direct current density. (5) Transformers: • main construction characteristics of single and three-phase transformers; • magnetic cores and electrical coils; • real transformer; • losses due to the Joule effect and iron losses due to hysteresis and eddy currents. (6) Transient and sequence analysis: • short circuit faults; • not symmetrical three phase system; • single and multi-phase electrical faults; • open circuit faults; • overcurrent protection system. (7) Effects of electricity on the human body: • components of a grounded system; • LV distribution systems; • protection from indirect electrical contacts.
Teaching format	Frontal lectures. Class lectures (blackboard and slides). Some of the lecture material (slides) will be available for download by the students.

Learning outcomes	The learning outcomes need to refer to the Dublin Descriptors. <u>Knowledge and understanding</u> 1. Knowledge of sinusoidal and three-phase network; design an electrical DC and AC power lines; identify

	behaviour of transformers; plan a network and select electrical protection; electrical safety. Applying knowledge and understanding 2. Capability of defining the requirements for design an electrical DC and AC power lines, calculate faults conditions and design the protection systems. Furthermore, students will be able to understand the effects of electricity on the human body and technical solutions to realize safety operating condition. Making judgements 3. The student will be able to assess the quality of existing electrical power network, identify critical aspects and suggest redesign solutions in case of short circuit faults. Communication skills 4. The student will be able to discuss the learned knowledge with vocabulary and technical terms of the discipline, describing efficiently the outcome of the design activity and the features of different technical solutions. Ability to learn 5. Lifelong learning capability through the acquisition of critical tools and critical evaluation of electrical power network and electrical device specifications.
Assessment	Oral examination with questions aimed at verifying the knowledge and the capability to understand the topics of the course and the mastery of the technical language. The capability to transfer these competences to applicative cases and the developed autonomy of judgment will be evaluated.
Assessment language	English
Evaluation criteria and criteria for awarding marks	Students will be evaluated on the basis of their preparation about course lessons. A single final vote will take into account of knowledge of the topics presented during the course, ability to synthesize information, correctness of the technical terms and clarity (50 %). With reference to the capability to analyse the proposed problem and to formulate a technically advantageous solution will be taken into account (50 %).

Required readings	Lessons and slides of the course

Supplementary readings	**Books** • M. Fauri, F.Gnesotto,G. Marchesi, A. Maschio, Lezioni di Elettrotecnica (vol. 2 Applicazioni Elettriche), Esculapio Editore, Bologna, 2002 • L. Fellin, R. Benato, Impianti elettrici, Utet Scienze Tecniche **Documents** • Power Point presentations will be available in the course reserve collection database of the Faculty. • Additional material will be provided by the Professor.	