Syllabus

Course Description

Course Title	Industrial electrical applications
Course Code	42156
Course Title Additional	
Scientific-Disciplinary Sector	IIND-08/A
Language	English
Degree Course	Bachelor in Industrial and Mechanical Engineering
Other Degree Courses (Loaned)	
Lecturers	Dott. Emanuele Fornasiero, Emanuele.Fornasiero@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/40134
Teaching Assistant	
Semester	First semester
Course Year/s	3
CP	6
Teaching Hours	60
Lab Hours	0
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	The course covers the topics of electrical power generation, distribution, conversion and usage, from a system level point of view. The main topics are as follows: - Production, transmission and distribution of electrical energy; sizing of electrical distribution lines - Electrical energy static conversion - Principles of operation of electrical machines - Applications and choice of electrical motors for simple applications Application examples will be also addressed. Other sub-topics are about thermal aspects, grid harmonics, electrical safety.

Course Topics	- Introduction about the role of electrical energy in nowadays world with some focus on primary energy sources - Production, transmission and distribution of electrical energy analysing the grid structure and with hints about electrical energy production - Comparison between different ways to transmit electrical energy and role of the three phase systems - Components of the transmission and distribution lines, and line models - Criteria for sizing electrical distribution lines with examples - Power factor compensation - Electrical safety hints, low voltage distribution systems and their main characteristics - Electrical energy static conversion, introducing rectifiers, inverters, switching power supply devices, choppers and their principle of working - Principles of operation of electrical machines - DC machines, structure, principle of working and main characteristics - AC machines, structure, principle of working and main characteristics - Induction (asynchronous) machines - Synchronous machines - Applications and choice of electrical motors for simple applications - Complementary topics: harmonic analysis on networks and associated problems, thermal considerations on electrical systems, devices and machines.
Keywords	Electrical energy, electrical machines, static converters, electrical systems, electrical energy transmission
Recommended Prerequisites	Elettrotecnica e macchine elettriche
Propaedeutic Courses	
Teaching Format	Frontal lectures, exercises, practical pc activities.
Mandatory Attendance	Not mandatory
Specific Educational Objectives and Learning Outcomes	The aim of the course is to provide the most significant elements on the applications of electrical engineering concepts. Students will learn the basics of electrical systems, machines, converters and plants, also dealing with the related safety issues.

	By means of case studies, energy efficiency and costs aspects will also be considered, considering both classical and innovative applications. Knowledge and understanding: • Master the most important concepts about industrial electrical applications • understand the design principles of electrical equipment and installations. Applying Knowledge and understanding: • Using proper criteria and tools for designing or choosing electrical systems and devices. The elements learnt are applied to real world case studies. Making judgments: • Ability to select the more adequate electrical system for a certain industrial application. Communication skills: • Acquisition of the field related technical terminology. • Ability to describe the state of the art of the technology adopted in electrical industrial systems. Learning skills: • Ability to learn autonomously is improved by acquiring analytical approaches, inter disciplinary skills and by reading and understanding scientific and technical documentation.
Specific Educational Objectives and Learning Outcomes (additional info.)	Knowledge and understanding: 1 Master the most important concepts about industrial electrical applications 2 understand the design principles of electrical equipment and installations. Applying Knowledge and understanding: 3 Using proper criteria and tools for designing or choosing electrical systems and devices. The elements learnt are applied to real world case studies. Making judgments: 4 Ability to select the more adequate electrical system for a certain industrial application. Communication skills:

	5 Acquisition of the field related technical terminology. 6 Ability to describe the state of the art of the technology adopted in electrical industrial systems. Learning skills: 7 Ability to learn autonomously is improved by acquiring analytical approaches, inter disciplinary skills and by reading and understanding scientific and technical documentation.
Assessment	The assessment of the course is by a written exam and a quiz. The written exam comprises 3 numerical exercises, one about the design of an electric line, one about the choice of an electric motor for a specific application, and one chosen from one of the following topics: i) dc machines; ii) static converters; iii) harmonic suppression. The quiz part consists of 20 generic theory questions covering the theoretical part of the course (multiple choice, open answer, true or false). - Formative Assessment: nof foreseen - Summative Assessment: 50% written exam, exercises: 3 exercises (3 hours); ILOs assessed: 1 ,2, 3, 4; 50% written exam, theory: 20 multiple choice questions (1 hour); ILOs assessed: 5, 6.
Evaluation Criteria	Final mark, 50% written part, 50% theory questions. Relevant for assessment: correctness and clarity of written answers, correct exercise results, proper explanation of the assumptions.
Required Readings	There is no single textbook covering the entire course content. The material is collected from various sources, which will be announced and delivered during the course.
Supplementary Readings	• Chitarin, G.; Gnesotto, F.; Guarnieri, M.; Maschi, A. & Stella, A. Elettrotecnica 2: Applicazioni, Editrice Esculapio • Fauri, Gnesotto, Marchesi, Maschio, “Lezioni di Elettrotecnica – Applicazioni elettriche”, Editrice Esculapio • Giorgio Rizzoni, „Elettrotecnica: principi ed applicazioni“, edizione italiana a cura di Paolo Gubian, Francesco Vacca, Silvano Vergura, McGraw-Hill • Hughes, A. Electric motor and drives, Elsevier
Further Information	Software used: Matlab, Simulink

Sustainable Development Goals (SDGs)	Quality education, Industry, innovation and infrastructure, Affordable and clean energy