Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Smart Grids
Code der Lehrveranstaltung	45550
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	IIND-08/B
Sprache	Englisch
Studiengang	Master in Energie-Ingenieurwissenschaften
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Dr. Vincenzo Trovato, Vincenzo.Trovato@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/46153
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
Studienjahr/e	Opt.
KP	6
Vorlesungsstunden	60
Laboratoriumsstunden	0
Stunden für individuelles Studium	90
Vorgesehene Sprechzeiten	18
Inhaltsangabe	The course and develops mainly the subjects of the operation and regulation of the national grid high voltage. After outlining the international framework of regulatory boards (CEN, CENELEC, ETSI, IEC, UCTE, etc ...), it introduces the equations of three-phase lines with the propagation constant and the characteristic impedance. It will explain then technological innovation on electric transmission

	and distribution, as well as the control system in real time. It will be explained the mechanisms to control voltage and frequency according to the request of reactive and active power. It will also expose the criteria for the protection of the transmission lines and moreover the problem of power quality and the characteristics of the free market.
Themen der Lehrveranstaltung	The course will cover the following topics: 1. Energy situation 2. Electrical circuit representation of transmission networks 3. Sinusoidal transmission lines 4. Management of networks and interconnection 5. Voltage control 6. Frequency control 7. Stability of the network 8. Overvoltage of internal origin and protection networks 9. Power quality 10. Free market energy
Stichwörter	Smart grids; Stability of the network; Free market energy; Transmission networks
Empfohlene Voraussetzungen	Students attending this course should already be familiar with the topics dealt in previous bachelor's and master's degree level courses, such as Physics II, Electrotechnics and Electrical Systems Engineering.
Propädeutische Lehrveranstaltungen	The Smart Grids Course is strictly related to the Electrical Systems Engineering course.
Unterrichtsform	Frontal lectures and seminars.
Anwesenheitspflicht	Not mandatory but recommended.
Spezifische Bildungsziele und erwartete Lernergebnisse	At the end of the course, students will have the following skills: 1. Knowledge and understanding: Understand the operation and design MV and HV AC power supply lines; 2. Applying knowledge and understanding: Being able to participate in the management of an electrical transmission network for controlling the frequency and voltage of the network; 3. Making judgements: Knowing how to judge, identify and resolve anomalies and failure

	conditions of the electricity transmission grids; 4. Communication skills: Interact with other operators and technicians to operate in the free energy market; 5. Ability to learn: Learn and develop new high voltage line protection systems.
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	The evaluation of students' training will take place with an oral test as summative assessment, during which the degree of learning (ILOs 1 and 5) and the ability to manage a transmission network (ILOs 2 and 3) will be assessed, together with their communication skills (ILO 4).
Bewertungskriterien	The preparation of the students will be assessed based on the degree of: • technical preparation of the topics covered; • learning of the operating and management methods of the electricity distribution and transmission networks; • ability to evaluate fault conditions and recovery methods.
Pflichtliteratur	PowerPoint presentations will be available in the course reserve collection database.
Weiterführende Literatur	· 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 · A. Paolucci, Trasmissione dell'energia elettrica, Padova · F. M. Gatta, Impianti elettrici, Esculapio Editore, Bologna, 2018 Additional material will be provided by the Professor.
Weitere Informationen	The Smart Grids Course is strictly related to the Electrical Systems Engineering course. The training of students allows them to find professional applications in:

	• public and private companies that manage electricity distribution and transmission networks. • industries that produce electrical equipment for medium voltage and high voltage.
Ziele für nachhaltige Entwicklung (SDGs)	Bezahlbare und saubere Energie, Industrie, Innovation und Infrastruktur, Maßnahmen zum Klimaschutz, Nachhaltiger Konsum und Produktion, Nachhaltige Städte und Gemeinden