Valid from 2024.HS

Module description: Introduction to Electrical Power Grids

Module Code	t.BA.EU.WSSN.13HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	IEFE
Module Coordinator	Petr Korba
Legal Framework	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.
Module Characteristic	Type 3b 2 lecture lessons per semester week and class+ 4 lab bi-weekly lessons per semester and half-class
Module Description	This course is one of the fundamental technical courses. It consists of theoretical (lectures) and practical parts (laboratory experiments). Students learn the physical and technical fundaments of AC (Alternating Current) circuit theory (including three-phase systems and one-port circuit elements) and the frequency-dependent behaviour of electrical circuits and networks. They also gain an understanding of the real behaviour of the key components of AC circuits and related phenomena, like the skin effect etc.
Module Content	**Lectures:** **Linear AC circuits with harmonic sources (description using phasors & complex numbers)** **Basic principles of the AC circuit theory (impedance, admittance, active/reactive/apparent power etc.)** **Three-phase AC-systems (symmetric and asymmetric loads, 3 and 4 wire systems, reactive power compensation etc.)** **Description of dynamic system behaviour in frequency domain (linear RLC circuits and their frequency response with Bode plots and transfer functions)** **Behaviour of real electrical elements (resistors, capacitors, inductors, transformers, Skin-Effect etc.)** **Labs:** **Harmonic signals and phasors** **AC one-port elements: Measurement and calculation of impedance, admittance, resonance etc.** **Physical meaning and calculation of AC power (active, reactive and apparent powers)** **Reactive power compensation in single and three-phase AC-systems** **Frequency behaviour of real electrical elements in AC-systems**
Prerequisite Knowledge	

Module description: Introduction to Electrical Power Grids

Learning Objectives (Competences)

Students...	Competencies	Taxonomies
Students are familiar with frequency characteristics of the AC circuits (they can draw, calculate and analyse the corresponding Bode plot and transfer functions)	F, M	K2, K3
Students know the mathematical principles of alternating current and three-phase electric power systems. They know the properties of AC and the AC behaviour of real linear one-port electrical elements; they can explain the physical principles and carry out calculation tasks with phasors.	F, M	K1, K2, K3
They are able to measure and understand the meaning of the electrical quantities such as:Impedance, admittance, etc.AC electric power (active, reactive and apparent)Frequency behaviour of real elements in RLC circuits	F, M	K3, K4
Students understand the fundamentals of the three phase systems and they can solve numerical examples with symmetrical und unsymmetrical loads in 3 and 4 wire AC-systems.	F, M	K2, K3, K4

Performance Assessment

End-of-module exam	Assessment	Length (min.)	Weighting	Form
written exam	Grade	90	60	acc. to module agreement

Performance assessment during the semester	Assessment	Length (min.)	Weighting	Form
written exam	Grade	60	20	acc. to module agreement
written exam	Grade	60	20	acc. to module agreement

Classroom Attendance Requirement

None

Learning material

Comments