Valid from 2024.HS

Module description: Electrical Engineering and Semiconductors 1

Module Code	t.BA.EU.ELHL1.12HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	IEFE
Module Coordinator	Andreas Heinzelmann
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 teaches students the basics of electricity and semiconductor physics. They also learn the practical handling of electrical devices and measurement equipment.
Module Content	**Lecture:** • - Basic electrical terms (charge, current, potential, voltage, energy, power) • - Kirchhoff's Rules, charge and energy conservation • - Electrical behavior: Resistance, temperature dependence • - two-terminal device (ideal and linear sources, operating point, power adjustment) • - Calculation of linear networks • - linear sources: source equivalent circuits, superposition principle • - Bridge circuits • - Electrostatic fields (force on charge carriers, field and equipotential lines) • - Stationary current flow field (field distribution, current density) • - Capacitors: capacity and energy content, dielectric, interconnection of capacitors • - Electric current as the cause of the magnetic field • - Magnetic flow and electrical induction • - Inductors, coupled Inductors: self-induction, mutual-induction and magnetic energy • - Basics of AC current, single devices in AC networks • - Basics of semiconductor physics, p/n junction and solar cells (I/V curve) • - Dynamic behaviour of capacitors and inductors (transients) **Internship:** • - Measurement of voltage and current • - Characteristic curves of passive linear and non-linear two-terminals • - Characterization of active one-port components • - Measuring a steady-state current flow field • - Law of induction • - Simulation and metrological investigation of switching processes for capacitors and inductors
Prerequisite Knowledge	

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Learning Objectives (Competences)

Students...	Competencies	Taxonomies
know the basic technical concepts of electricity and the elementary static and dynamic laws of electricity.	F	K1, K2, K3
are able to describe and calculate the behavior of individual linear electrical components.	F, M	K1, K2, K3
are able to calculate the behavior of electrical direct current circuits.	M, F	K1, K2, K3
are able to calculate and draw electric fields.	M, F	K1, K2, K3
are able to calculate magnetic fields of current-carrying conductors with simple geometry.	M, F	K1, K2, K3
can apply the law of induction.	F, M	K1, K2, K3
can determine the properties of individual electrical components (resistor, coil, capacitor) in alternating current circuits.	M, F	K1, K2, K3
know the basics of semiconductor physics, the p-n junction and the solar cell.	F, M	K1, K2, K3
will acquire practical skills in handling measuring devices and electrical components	F, M	K1, K2, K3

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	45	20	acc. to module agreement
Internship tests *Exams for the internship*	Grade		20	acc. to module agreement

Classroom Attendance Requirement

None

Learning material

- Nerreter, W. (2020). Grundlagen der Elektrotechnik. 3 Edition. München: Hanser Verlag. ISBN 9783446464568.

Comments