Technology
Arts Sciences
TH Köln

Course Manual LE

Power Electronics

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General information

Long name	Power Electronics
Approving CModule	LE_BaET
Responsible	Prof. Dr. Christian Dick Professor Fakultät IME
Valid from	summer semester 2022
Level	Bachelor
Semester in the year	summer semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Christian Dick Professor Fakultät IME
Requirements	Complex alternating current calculation for linear AC applications (basic areas of electrical engineering) Integral Calculation of Sectionally Defined Functions (Mathematics) Fourier analysis (understanding orthogonal functions for active and reactive power determination)
Language	German, English if necessary

Literature

Mohan; Undeland; Robbins: Power Electronics – Converters, Applications and Design Wiley Verlag, USA

Online Kurs der ETH Zürich: www.ipes.ethz.ch

Final exam

Details	Due to the expected number of participants, the summary examination is planned to take the form of a written examination, in individual cases also a structured oral examination. The exam ensures that each student has reached the L.O. goals individually. 80% of this summary examination is included in the overall grade. The remaining 20% weighting is based on a lab.

Separate final exam	Yes

Minimum standard	Clean separation of mean values, effective values and time-transient signals. Clean handling of the component equations of passive components for time-transient signals. Understanding of the switched character of the electronics (when which semiconductor conducts), and why switching takes place (->energy efficiency).
Exam Type	EN Klausur

− Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	Basics (components, pulse-width modulation, signal description, steady-state analysis, network perturbations) Forced-commutated DC-DC converters (buck converter, boost converter, buck-boost converter, two-quadrant converter, H4 bridge as DC-DC converter) Forced-commutated inverters and rectifiers (H4 bridge as DC-AC converter, three-phase pulse inverter) Outlook: Thyristor-based power electronics
Skills	The student has a fundamental judgment as to whether or not power electronics should be used for a particular technical application. The student is aware of the importance of power electronics for automation, energy technology and energy efficiency. The students know how the most important converters work. They are familiar with the terms used to describe and characterise power electronic circuits. The student can analyse and discuss concrete power electronic circuits with regard to efficiency, feedback effects and component costs. The series of toolbox topics necessary for the lecture (THD calculation, semiconductor devices, ...) can be fully applied by the student.

Special requirements

Complex alternating current calculations, active and reactive power (fundamental reactive power), high understanding of integral calculations for functions defined in sections, Fourier series as basis for orthogonality of signals

Accompanying material	lecture scipt, exercise script, Simualation tool for simple circuits with description
Separate exam	No

Expenditure classroom teaching

Type	Attendance (h/Wk.)

Lecture	2
Exercises (whole course)	0
Exercises (shared course)	2
Tutorial (voluntary)	0

− Practical training

Learning goals

Goal type	Description
Knowledge	Rectifier circuits, self-commutated converters, evaluation of filter properties
Skills	Handling a simulation tool, circuit design, handling laboratory equipment such as oscilloscopes etc..., preparation of technical reports

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

Special requirements

Complex alternating current calculations, active and reactive power (fundamental reactive power), high understanding of integral calculations for functions defined in sections, Fourier series as basis for orthogonality of signals

Accompanying material	Lab documents
Separate exam	Yes

Separate exam

Exam Type	undefined
Details	1. partial mark: entrance certificate. The student is asked to what extent he/she is prepared and has understood the contents to such an extent that participation makes sense. Good contributions, including good questions, are also assessed. 2nd sub-rating: During the internship the supervisors ask various questions, but especially: "What are you doing right now? The answer goes into the evaluation. 3rd sub-rating: After the internship, an elaboration is prepared and assessed. The interview and the observation of the internship is regarded as an essential form to recognize the competence of the students.

Minimum standard	The students show that they have prepared themselves, that they have understood in advance what the subject of the internship is and that they are actively involved in the internship.