Technology
Arts Sciences
TH Köln

Course Manual GE3

Fundamentals of Electrical Engineering 3

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General information

Long name	Fundamentals of Electrical Engineering 3
Approving CModule	GE3_BaET
Responsible	Prof. Dr. Wolfgang Evers Professor Fakultät IME
Valid from	winter semester 2021/22
Level	Bachelor
Semester in the year	winter semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Wolfgang Evers Professor Fakultät IME
Requirements	The students master the basic mathematical concepts and in particular can deal with sets, functions, terms and equations. You can determine the properties and graphs of the most important real functions. You can calculate limits on sequences and functions, and examine functions for continuity. They know the definition of the

Literature

Philippow E., Grundlagen der Elektrotechnik Verlag Technik GmbH, Berlin, 1992

Frohne H., Löcherer K.-H., Müller H, Moeller - Grundlagen der Elektrotechnik Teubner Verlag, Wiesbaden, 2005

Karl Kupfmüller, Einführung in die theoretische Elektrotechnik Springer Verlag, Heidelberg, 1990

Clausert H., Wiesemann G., Grundgebiete der Elektrotechnik 1 Oldenbourg Verlag, München, 2005

Final exam

Details	Written examination, in some cases also oral examination, with the following content: - Electrostatic field - Electric current field - Electromagnetic field - Electric induction - Coupled conductor loops
Minimum standard	Achieving 40% of the points in the tasks
Exam Type	EN Klausur

derivative and its descriptive meaning, master the application of the different derivation rules and can determine tangents.
Students can count on vectors. You can describe lengths and angles, lines and planes, and solve the tasks of analytical geometry.
They know matrices and master the calculation methods. You can determine the solution set of linear equation systems using the Gaussian elimination method. You can create the relationship between linear mappings and matrices. You can determine the rank of matrices. You can calculate the determinant and determine eigenvalues and eigenvectors.
The students master the handling of complex numbers.
They master the Riemann integral and can estimate integral values. They use the law of differential and integral calculus and the most important integration rules for calculating integrals.
Students can:
- Recognize electrotechnical issues and arrange them correctly
- properly name and apply required sizes
- fully analyze electrical networks
- Calculate and apply equivalent circuits
- Estimate and classify services and work
- Optimize services
- Calculate efficiencies
Students can describe electrical quantities (sinusoidal voltages and currents, linear load bipoles and powers) using timeline diagrams, pointers and

	complex quantities, as well as using phasor diagrams.
Language	German
Separate final exam	Yes

− Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	- The static electric field * Electric charges and their effects * The mobile (trial) charge in the electric field * The capacity * Matter in the electric field - The electric current * The movement of a single charge in the electric field * The movement of distributed charges, current and current density * Space charge flow * Space charge-free flow in the metallic conductor, the ohmic law * Flow fields, calculation of the ohmic resistance * Interfaces, refraction law * Energy and performance * Mechanisms of power line - Stationary magnetic fields * The magnetic dipole * Forces in the magnetic field and magnetic induction * The excitement of the magnetic field * The magnetic flux * Conditions at interfaces * Magnetic circles - Movements in the magnetic field and time-varying magnetic fields * Lorentz power * Charge separation in the moving conductor * Hall effect - The self-inductance of a conductor loop - Magnetic field energy and forces * The magnetic field energy * Hysteresis losses * Magnetic field forces (virtual displacement principle) - Magnetically coupled conductor loops * Description in the time domain * Complex description of the transformer quad

Special requirements

none

Accompanying material	- Electronic lecture notes - Detailed exercise task collection with solutions
Separate exam	No

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	3
Exercises (whole course)	2
Exercises (shared course)	0
Tutorial (voluntary)	0