Technology
Arts Sciences
TH Köln

Course Manual EEZ

Electric power generation

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General information

Long name	Electric power generation
Approving CModule	EEZ_BaET
Responsible	Prof. Dr. Wolfgang Evers Professor Fakultät IME
Valid from	summer semester 202
Level	Bachelor
Semester in the year	summer semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Wolfgang Evers Professor Fakultät IME

Literature

Günter Cerbe and Gernot Wilhelms, Technische Thermodynamik Carl Hanser Verlag, München, 2013, ISBN 978-3-446-43638-1

Klaus Lucas, Thermodynamik Springer Verlag, Berlin, 2008, ISBN 978-3-540-68645-3

Dietrich Oeding, Bernd R. Oswald, Elektrische Kraftwerke und Netze Springer Vieweg Verlag, Berlin, 2016, ISBN 978-3-662-52702-3

Adolf J. Schwab, Elektroenergiesysteme Springer Verlag, Berlin, 2009, ISBN 978-3-540-92226-1

Final exam

Details	Written examination, in some cases also oral examination, with the following content: - Single choice questions about the content of the lecture - Text exercises on thermodynamic cycle processes
Minimum standard	Achieving 50% of the points in the questions and tasks
Exam Type	EN Klausur

Requirements	The students master the basic mathematical concepts and in particular can deal with sets, functions, terms and equations. They can determine the properties and graphs of the most important real functions. They can calculate limits on sequences and functions, and examine functions for continuity. They know the definition of the differential calculus and its descriptive meaning, master the application of the different differential calculus rules and can determine tangents. 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.
Language	German
Separate final exam	Yes

− Lecture / Exercises

Learning goals

Goal type	Description

Special requirements

none

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

Knowledge	- Fundamentals and definitions from classical thermodynamics * System and system limit * State variables * Equation of state of ideal gases * The kinetic energy of the molecules * The specific heat capacities * The inner energy U * The energy form work * The energy form heat (1st law of thermodynamics) * The enthalpy H * Efficiencies of thermal energy converters - working diagrams * The q,T diagram * Changes in the state of the gases and their representation in the q,T diagram * Definition of entropy * The T,s diagram * The p,v diagram - Thermodynamic cycles * The Carnot Process * The Ericsson process * Stirling process * Comparison of the processes in the T,s diagram - Gas turbines - The steam power plant process * The p,v diagram * Specific state variables of the steam * Steam table * The h,s diagram for water / steam * The Clausius Rankine Process * Increase the efficiency of steam power plants * Combined cycle power plants (gas and steam) - Nuclear power plants * Fundamentals of nuclear energy * Nuclear fission * Moderation of the neutrons * Reactor control * Breeder reactors * Fuel elements * Self-regulation behavior * Units of nuclear technology * Safety philosophy * Reactor types * Reprocessing * Disposal - Hydropower * Importance * Work capacity of hydropower * Water turbines
Skills	Solving problems related to thermodynamic cycle processes used in thermal power plants.

Expenditure classroom teaching

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

− Practical training

Learning goals

Goal type	Description
Skills	- Plan tests and perform them safely * Build experiments * Apply security rules - Perform experiments with realized circuits - Explain the results - Complete complex tasks in a team

Expenditure classroom teaching

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

Special requirements

none

Accompanying material	Electronic instructions for the lab exercises
Separate exam	Yes

Separate exam

Exam Type	EN Projektaufgabe im Team bearbeiten (z.B. im Praktikum)
Details	Written test to control the preparation of the lab excercises Evaluation of the preparatory documents Evaluation of the discussion with the students and of the lab exercises on the basis of a structured protocol
Minimum standard	70% of the written test correctly 80% of the prepared documents 80% of the experimental setup correct 80% of the discussion makes sense