Technology
Arts Sciences
TH Köln

Course Manual SNEE

Electrical Power Grids for Renweable Energy

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General information

Long name	Electrical Power Grids for Renweable Energy
Approving CModule	SNEE_MaET
Responsible	Prof. Dr. Eberhard Waffenschmidt Professor Fakultät IME
Valid from	summer semester 2021
Level	Master
Semester in the year	summer semester
Duration	Semester
Hours in self-study	78
ECTS	5
Professors	Prof. Dr. Eberhard Waffenschmidt Professor Fakultät IME
Requirements	Basics of electrical Engineering, especially alternating current calculations with complex numbers and three phase systems
Language	German, English if necessary
Separate final exam	No

Literature

Klaus Heuck, Klaus-Dieter Dettmann, Detlef Schulz, "Elektrische Energieversorgung", 7. vollständig überarbeitete und erweiterte Auflage, Vieweg Verlag, Wiebaden, 2007. ISBN 978-3-8348-0217-0

Dieter Nelles, Christian Tuttas,"Elektrische Energietechnik", B.G. Teubner Verlag, Stuttgart, 1998, ISBN 3-519-06427-8

Valentin Crastan,"Elektrische Energieversorgung 1: Netzelemente, Modellierung, stationäres Verhalten, Bemessung, Schalt- und Schutztechnik", 2. bearbeitete Auflage, Springer Verlag, Berlin Heidelberg New York, 2007, ISBN 978-3-540-69439-7

„Erzeugungsanlagen am Niederspannungsnetz – Technische Mindestanforderungen für Anschluss und Parallelbetrieb von Erzeugungsanlagen am Niederspannungsnetz“, VDE-Anwendungsregel VDE-AR-N 4105, Aug. 2011, verbindlich gültig ab 1.1.2012.

− Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	- The students name different grid topologies, components and are able to use terms related to electrical power grids. - They consider their knowledge of relevant technical and legal requirements for the connection of decentralized generators to the power grid. - They know different calculation methods for the analysis of electerical power grids and apply the suitable methode for a particular problem. - They consider the basiccs for the control of electrical power grids using suitable control methods. - Summarizing it includes the following topics: - Grid topologies and components - Calculation and simulation of power grid - Fault management - Grid control - Gridconnection of decentralized generators Based on these competencies the students perform project works (see "Projektarbeit").

Special requirements

none

Accompanying material	- Lecture presentations in PDF-Format, online in ILILAS available
Separate exam	Yes

Separate exam

Exam Type	undefined
Details	oral exam (40% of the final grade) using picture cards, which show content of lecture presentations. This allows the testing of higher valued competences like analysis and judgement as well as the ability to put facts into a complex context.
Minimum standard	Grade 4.0

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Tutorial (voluntary)	0

− Lecture / Exercises

Learning goals

Goal type	Description
Skills	Based on the knowledge of the lectures the students perform a project. They create simulation models of electrical power grids working in teams of 3 to 4 persons. They analyze the simulation results according to frame conditions and evaluate the results along self generated goals. Project topics are: Future loads of electrical power grids due to - Photovoltaics - Electromobility - Electrical heat usage - Electrical heat storages under different requirements as e.g. settlement areas - city - suburban - rural The project work is performed during the presence time with moderation of the lecturer and as homework.

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Project	2
Tutorial (voluntary)	0

Special requirements

none

Accompanying material	- Selected papers and data, online in ILIAS
Separate exam	Yes

Separate exam

Exam Type	EN Projektaufgabe im Team bearbeiten (z.B. im Praktikum)
Details	Presentation of poject results (30% of the final grade): Each team presents its results in a mutual presentation. Each teammember contributes to the presentation. Individual grades will be assigned to each presenter. And: Writing a report about the project results (30% of the final grade): The report is written by the whole team as a scientific paper with maximal 4 pages. A common grade will be assigned to all memebers of a team.
Minimum standard	grade 4.0