inf511 - Smart Grid Management

Module label: Smart Grid Management
Module code: inf511
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Master's Programme Business Informatics > Bereichswahlmodule
- Master's Programme Computing Science > Angewandte Informatik
- Master's Programme Engineering Physics > Schwerpunkt: Renewable Energies
- Master's Programme Environmental Modelling > Mastermodule

Contact person:
Module responsibility:
- Sebastian Lehnhoff
- Die im Modul Lehrenden

Authorized examiners:
- Sebastian Lehnhoff
- Die im Modul Lehrenden

Entry requirements:

Skills to be acquired in this module:

After successful completion of the course the students should be able to understand the existing structures and technical basis of energy systems to produce, transfer and distribute electricity and their interaction and dependency on each other. They should have developed an understanding for necessary IT- and process control technology components, methods and processes to control and operate electrical energy systems. The students are able to estimate and evaluate the requirements and challenges of ICT and computer science which are caused by the development and integration of unforeseeable fluctuations of decentralised plants. The students will be able to estimate the influence of distributed control concepts and algorithms for decentralised plants and consumers in the so called Smart Grid energy systems. Regarding the requirements the students will be able to analyse the safety, reliability, realtime capability and flexibility of Smart Grid energy systems.

Professional competence:
The students:

- understand the existing structures and the technical basis of energy systems producing, transferring and distributing electricity and their interaction and dependency on each other.
- develop an understanding for necessary IT- and process control technology components, methods and processes to control and operate electrical energy systems.
- estimate and evaluate the requirements and challenges of ICT and computer science which are caused by the development and integration of unforeseeable fluctuations of decentralised plants.
- estimate the influence of distributed control concepts and algorithms for decentralised plants and consumers in the so called Smart Grid energy systems.

Methodological competence:
The students:

- analyse the safety, reliability, realtime capability and flexibility of Smart Grid energy systems
- use advanced mathematical methods to calculate networks

Social competence:
The students:

- create solutions in small teams
- discuss their solutions

Self-competence:
The students:

- reflect their own use of electricity as a limited resource
## Module contents

Content of the Module: In this course information technology, economical energy industry and technical basic knowledge and methods are analysed by using concrete Smart Grid approaches. The basic calculation methods for an intelligent grid management are introduced.

This module deals with the technical and economical framework for a permissable electrical network as well as mathematical modelling and calculation methods to analyse conditions of electrical energy networks (in stationary conditions).

These are:

- The organisation of the EU energy market (regulatory framework, responsibility in liberalisation of electrical energy systems)
- Establishment and operation of electrical energy supply networks (network topology, statutory duties of supply, supply quality/system services, malfunctions and protection systems)
- Intelligent network management (Smart Grids), aggregation forms, machine learning approaches

## Reader’s advisory

Suggested reading:

- Crasran V.: "Elektrische Energieversorgung II", Springer 2004

## Links

- **Language of instruction**: German
- **Duration (semesters)**: 1 Semester
- **Module frequency**: jährlich
- **Module capacity**: unlimited
- **Modullevel**: AS (Akzentsetzung / Accentuation)
- **Modulart**: je nach Studiengang Pflicht oder Wahlpflicht

## Lern-/Lehrform / Type of program

### Previous knowledge

### Examination

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
<td>At the end of the semester</td>
<td>Oral exam</td>
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### Course type

<table>
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<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
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<td>3.00</td>
<td>SuSe</td>
<td>42 h</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>1.00</td>
<td>SuSe</td>
<td>14 h</td>
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### Total time of attendance for the module

56 h