## pre375 - Smart Grids

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<thead>
<tr>
<th>Module label</th>
<th>Smart Grids</th>
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<td>Module code</td>
<td>pre375</td>
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<tr>
<td>Credit points</td>
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<td>Workload</td>
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<td>Used in course of study</td>
<td>- Master's Programme European Master in Renewable Energy (EUREC) &gt; Mastermodule</td>
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<td>Contact person</td>
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### Skills to be acquired in this module
By the end of this module, students should be able to program and protect smart grids. Student will get a suitable knowledge on:
- smart grid concept and development
- protection system in electrical power systems
- telecommunication infrastructure in smart grids

**Engineering design:**
Graduates will be able to design engineering solutions to the challenge of programming smart-grids. They will be able to do the complex task of coordinating protective devices for RE, integrate mini and micro generation in distribution grids or plan and optimise primary-secondary distribution systems.

**Transferable skills:**
Graduates will be able to work effectively as a professional and as team member in the resolution of technical problems related to integration of RE in electric grids. Also, graduates will demonstrate their abilities to communicate effectively in multinational groups.

### Module contents

1. Programming of intelligent networks
   - Smart Grids from the point of view of the network operator (Demand Management, Electric Vehicle, Storage...)
   - Operation and network planning with quality criteria distribution
   - Optimization Techniques
   - Practice microgrids

2. Protections
   - Introduction
   - Overcurrent protection
   - Distance protection
   - Differential protection
   - Protection coordination
   - Problematic of distributed generation

3. Smart Grids
   - IEC 61850 communications
   - Visit to Red Eléctrica de España control center
   - Visit to UFD facilities: Smart grids projects
   - PLC communications: Malaga Smart city experience
   - Visit to ERZ control center: smart meters

### Reader’s advisory

### Links
- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Modullevel: MM (Mastermodul)
- Modulart: Pflicht
- Lern-/Lehrform / Type of program: Lecture, Laboratory, Excursion, Tutorials

### Examination
- Time of examination: After end of lectures of module
- Type of examination: Written exam (50%): 2 hours
  Subject’s work (10%): approx. 4 hours
  (Subject’s work refers to the different assignments that students are asked to finish after a preliminary session during the lessons)
  Presentation (40%): 20 minutes (developed topic)

### Course type
- Seminar
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