pre311 - Renewable Energy Basics

Module label: Renewable Energy Basics
Module code: pre311
Credit points: 6.0 KP
Workload: 180 h

Used in course of study: Master's Programme European Master in Renewable Energy (EUREC) > Mastermodule

Contact person:
- Carsten Agert
- Joachim Peinke

Module counseling:
- Tanja Behrendt
- Robin Knecht
- Hans-Gerhard Holtorf
- Jörg Ohland
- Paul Ziethe

Entry requirements:
After completing the module, the student will:
- have a good understanding of the physical principles of Renewable Energy Technologies
- be able to apply principal mathematics related with the underlying physical laws and rules to measure and solve problems during their further studies
- have a good understanding of the fundamentals of electrical circuits and related physical laws
- have a good understanding of the fundamentals of electrical machines and the interaction of electrical components of the electric grid
- have a good understanding of the basic concepts of the photovoltaic effect in semi-conductors
- be familiar with the measurement procedures needed for the winter lab experiments in the subject related modules.
- be familiar with working and studying in intercultural teams
- be familiar with the experimental set-ups of the PPRE lab
- understand to relate physical, engineering, and mathematical laws to models of energy supply technologies
- be able to establish simple models and measurement strategies to investigate the behaviour of the respective models.
- be familiar with the principles of scientific working

Module contents:
Renewable Energy Basics
- Thermodynamics
- Hydrodynamics
- Black and Grey Body Radiation
- Property of (humid) air
- Heat Transfer
- Economic Evaluation of Investments
Winter Introductory Laboratory
- Simple electrical circuits
- Inner resistance of power sources
- Measurement of time depending signals
- Measurement of temperature and radiation
- Introduction of standard sensors in radiation and temperature measurement
- Introduction of measurement devices: multimeter, oscilloscope, x-t-writer

Electrical Power Systems
- Fundamentals in AC/DC
- Fundamentals of magnetic fields
- Transformers
- DC machines
- Asynchronous-machines
- Synchronous machines
- Semi-Conductor Physics
- Definition of semi-conductor
- Crystal Lattice
- Atom models
- Chemical bonding
- Quantum mechanics
- Photoelectric effect
- pn-Junction
- Solar cell

Reader's advisory:
Oelert, Gerhard, Economic issues of renewable energy systems : a guide to project planning; ISBN, Roßdorf TZ Verlag
Sørensen, Bent, 2003: Renewable energy. Its physics, engineering, use, environmental impacts, economy and planning aspects; 2nd ed., Acad.Press.
General books on experimental laboratory work and report writing:
Kirkup, Les, 1994: Experimental methods: an introduction to the analysis and presentation of data; Brisbane, Wiley.
Kuhschewski, Udo, Knecht, Robin and colleagues, update 2013: Reader for the Introductory Lab Course: AC/DC principles, fast signals, power, measurement strategies, sensors in RE and measurement devices

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<thead>
<tr>
<th>Links</th>
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<tbody>
<tr>
<td>Language of instruction</td>
<td>English</td>
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<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
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<tr>
<td>Module frequency</td>
<td>jährlich</td>
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<td>Module capacity</td>
<td>unlimited</td>
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<td>Modullevel</td>
<td>MM (Mastermodul)</td>
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<td>Modulart</td>
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| Type of program | Lecture, Seminar, Exercise, Laboratory |

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<thead>
<tr>
<th>Vorkenntnisse / Previous knowledge</th>
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<tr>
<td>Examination</td>
<td>Time of examination</td>
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<tr>
<td>Final exam of module</td>
<td>Type of examination</td>
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<tr>
<td>RE Basics Physics: After end of lectures (end of October)</td>
<td>RE Basics Physics (25%): Oral exercise (1 hour)</td>
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<tr>
<td>Semiconductor Physics: After end of lectures (mid-December)</td>
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<tr>
<td>Electrical Power Systems: After end of lectures (mid-January)</td>
<td>Electrical Power Systems (25%): Written exam (0.5 hours)</td>
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<tr>
<td>Solar Spectrum Lab: During Semester</td>
<td>Solar Spectrum Lab (25%): Written report (10 - 20 pages)</td>
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| Course type | Seminar |
| SWS | 0 h |
| Frequency |  |

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