**pre316 - Biomass Energy & Hydro Energy**

**Module label** Biomass Energy & Hydro Energy  
**Module code** pre316  
**Credit points** 3.0 KP  
**Workload** 90 h  
**Used in course of study** Master's Programme European Master in Renewable Energy (EUREC) > Mastermodule  
**Contact person**
- Carsten Agert  
- Alexandra Pehlken  
- Hans-Gerhard Holtorf  
- Robin Knecht

**Entry requirements**

**Skills to be acquired in this module**
- After the completion of this module the student will
  - have a good understanding the potential of Biomass as an energy carrier
  - be able to critically assess the sustainability of biomass, and hence the advantages and limits of biomass to energy
  - have a good understanding of the main technical components of micro hydro power, tidal power, and wave power systems
  - be able to size a Micro-hydro Power Plant for a given local geographic and hydrological conditions
  - be able to critically assess advantages and disadvantages of micro hydro power, tidal and wave power systems in comparison with other renewable energy technology from a technical point of view

**Module contents**

**Biomass Energy:**
- introduction into Photosynthesis, chemical storage of solar energy, efficiency of various
- composition of biomass: sugar, starch, protein, fats, lignin
- typical soil conditions and the relation to plant growth, energy content of different plants
- typical energy plants in various regions and climates
- biomass usage in various geographical and climate regions
- traditional and modern technologies of energy biomass usage and its efficiency
- degradation processes of biomass: micro-organisms, classification and metabolism

**Hydro Energy:**
- theoretical background (general hydraulic terms, Bernoulli equation, major empirical formulae)
- water resource (catchment area, seasonal precipitation, flow duration curve, dam and run off river)
- marine resource (tides and waves, time dependency, energy & power content)
- powerhouse (penstock, water hammer, cavitation, tailrace)
- turbines (main types of turbines, their characteristics & their components)
- generators (main types of generators & their characteristics)
- control System (adaptation power input and load)

**Lab Work:**
- acceptance test of a centrifugal pump

**Reader's advisory**

**Biomass**
Bagain, Sundar & Shakya Idira, 2005: A successful Model of Public Private Partnership for Rural Household Energy Supply,  
Bhojvaid, P.: Biofuels towards a greener and secure energy supply, Rajkamal electric Press, Delhi.  
Biomass Energy Data Book of the US Department of Energy for Download:  
FAO:  

**Hydro Energy**

Links
Language of instruction  English
Duration (semesters)   1 Semester
Module frequency     jährlich
Module capacity      unlimited
Module level      MM (Mastermodul)
Module art       Pflicht
Lern-/Lehrform / Type of program       Lecture, Excursion

Vorkenntnisse / Previous knowledge

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<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>Hydro Power: At the end of lecture period (end of January)</td>
<td>Hydro Power (30%): Written exam (1 hour)</td>
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<td>Biomass: At the end of lecture period (end of January)</td>
<td>Biomass (40%): Written exam (1 hour)</td>
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<td>Pump Lab: During Semester</td>
<td>Pump Lab (30%): Written report (10 - 20 pages)</td>
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Course type       Seminar

SWS
Frequency
Workload attendance     0 h