

International Winter University (IWU) Kassel 2010 Environmental Engineering– Renewable Energy Sources

Topics:

- **Introduction: International Climate Policy**
Wuppertal Institute for Climate, Environment, Energy

- **Biomass**
Students will be introduced to the natural and economic situation of agriculture in Germany and to the research and teaching activities on organic farming in *Witzenhausen* near Kassel. The main focus will be on the production of bio energy, which receives much interest in the public due to the actual energy crisis. This topic will be covered with lectures on the production of biomass, on harvesting and conversion techniques. Insight into realization of technologies will be given on a field excursion to *Jühnde*, which was the first bio energy village in Germany.

- **Solar Thermal Technology**
 - Sky geometry
 - Available solar radiation
 - Solar collectors (air and water collectors, types, parameterisation and characteristic curves)
 - Solar water storages (types)
 - Solar thermal systems for one-family houses (domestic hot water; combi systems)
 - Large-scale systems (domestic hot water; seasonal storages)

- **Low Energy Housing**
 - The Energy System Building: Where and how is energy used in buildings, how much energy is used, what kind of systems (HVAC) are used, compare typical American systems (AC) with Central European systems; energy efficient buildings are “more” sustainable because about 80% of the environmental load is caused by energy process, importance of insulation and air-tightness.

 - Dependency between energy use in buildings and energy production (renewable): How can we influence/optimize the system to use more renewable energy sources and to be more efficient, low temperature/high temperature cooling opens the way for the integration of renewable energy sources, passive means of heating and cooling (night cooling, etc.), latest research in that field: Low Energy Systems (Activities in the frame of the International Energy Agency (IEA), national German research program, cooperation with ASHRAE (American Society for Heating,

Refrigerating and Air-Conditioning Engineers Inc.). Use the energy concept in building and for optimising of designs.

- The Centre for Sustainable Building (ZUB): Have a look at the LowEx office building of ZUB, where some of the systems are implemented, get results from the measurements, and the monitoring.

- **Wind Energy and Photovoltaic Systems**

ISET, Institute for Solar Energy Supply Technology

The training course “Wind Energy Utilization” will be on an introductory level. It will provide the participants with basic knowledge about potentials, wind energy physics, technical and economic issues. An excursion to a local wind farm cooperative will give some hands-on experience and the opportunity for the students to climb a turbine. The photovoltaic lecture will deal with potentials and basic principles of the solar cell.

- **Regional Network for Renewable Energy Production and Distribution**

„deENet“, Kompetenznetzwerk Dezentrale Energietechnologie e.V.

This seminar presents a model of efficient energy production and distribution at regional level. The model is based on the work of “deENet” (Competent Network for Decentralized Energy Technology). deENet, a network of companies specialized in the production and distribution of energy, is dedicated to the protection of energy resource through efficient system solutions. Its project “100%-Renewable-Energy-Regions” in Germany wants to analyse and evaluate success factors for regions which want to change over to 100% renewable energy supply. With the help of model regions and scenarios, the project develops fundamental solution strategies for using natural resources.

Excursions:

- Jühnde: bio energy village
- Wind park
- SMA: one of Germany's leading companies for solar systems and inverter technologies

Assignment:

Students will be given a project that incorporates all the topics of the course. They will make suggestions on how to implement renewable energy sources at their home universities or their native country in general. A written report will be due at the end of the course.

Credits: 4 ECTS, 45 contact hours.