



Contents of the e-Learning of the ISU Env. Sc. based on a textbook and various lessons in written form

A) Introduction to Environmental Sciences:

Environmental Protection / Nature Conservation / Biodiversity / Ecology / Climate Protection / Material Flow Analysis / Sustainable Management of Resources / Green Business / System of Renewable Energies / Environmental Innovations / Visit at Federal Environment Agency in Dessau-Roßlau / Prognosis till 2050.

B) Compact Course "Bio-Energy and Environment – Energy supply from renewable raw materials"

Chemistry, biology, physics, processes und plants, profitability, safety aspects, case studies, ethic criteria of biomass utilization // **Sustainability by Bioenergy:** ways of CO₂-reduction, status and prospects of supply and use of bioenergy, future of hydrogen economy, present and future energy mix // **Biomass:** basics, production, processing, utilization; bio-solar-physics, biochemistry, photosynthesis; systematization of biomass (terrestrial, aquatic), principles of plant growth, sustainable growing and usage of biomass (energy plants, energy wood, biowaste, algae etc.), biomass processing, bio-refinery I (production of active agents, primary products, energy sources) // **Solid Bio-Fuels:** energy forests as short-rotation plantations (poplar, willow, robinia), usage characteristics (logs, wood chips, pellets), yield and profitability; Liquid Bio-Fuels: bio-fuel made from sugar and grain, biodiesel made from oil fruits, biomass to liquid (BTL) made from cellulose, hemicellulose und lignin // **Biogas/ Landfill gas:** biogas und composition (chemistry, physical-chemical data), bio-reaction technology (hydrolysis, methanisation, dry and wet fermentation), landfill gas, biogas technology, gas collection and disposal, potential danger of biogas (toxicity, flammability, explosion); Bioenergy plants / Safety and Process Engineering: combustion processes, firing systems (solid, liquid, gaseous), combined heat-power plant, safety of bioenergy plants (in particular fire and explosion protection), feeding of biogas into the natural gas grid, bio-refinery II (energy efficiency, environmental compatibility), energy and project management, planning, approval and operation of bioenergy plants.

C) Compact Course "Solar Energy"

Solar physics: phenomena of Solar Physics, solar radiation, radiation and heat balancing // **Photovoltaic Systems:** structure and function, manufacture, planning and design of photovoltaic systems, eco-assessment, study trip // **Solar thermal energy:** structure and function, solar thermal collectors, manufacture, planning and design, utilization of solar thermal installations, eco-assessment, study trip // **Solar power plants:** types of solar power plants, structure and function, planning and design, eco-assessment, study trip, Solar architecture: combination of different disciplines of solar technology, development of integrated building and energy concepts, energy efficient building service equipment, integration of solar energy into urban planning and building design.

D) Compact course "Wind and Water Power as well as Geothermal Energy"

Physical principles, energy conversion, electricity from wind and water power, environmental heat, power plants, energy storage.

E) Compact course "Energy efficient installations as heat pumps, fuel cells, heat-power cogeneration, combined heat-power plants, hybride power plants, bio-refineries, energy storage a.o."