



Course description

Course title: The Potential of Renewable Energies – can we satisfy our thirst for Energy in a sustainable way?

Hours per week: 20h/week, 2 weeks

Number of credits recommended/ work load:

- a) 40 contact hours
- b) 3 US Quarter credits
- c) 4 ECTS credits

Course description:

The Potential of Renewable Energies helps the students to gain a broad overview of our energy consumption and the energy production using clean energy sources. Using simple Physics to understand the subject of energy and to estimate the potential of environmental energies with correct order of magnitudes, gives the students the ability to participate in the important discussion about energy in a constructive manner. Understanding the underlying facts about energy – consumption and production - is the basis for useful political decisions that will shape our future.

Course Content:

A) Motivation

- Understanding the numbers is the basis for a constructive discussion
- Identifying green wash
- Finiteness of fossil energy
- The impact of fossil energy on our world

B) Our energy consumption for Germany

- Difference between primary and final energy
- Energy production in Germany by energy source
- How much do renewables contribute today?
- break-down of energy consumption - industry, transport, mobility, heating, electricity, food production
- Electricity grid and control
- Effect of electrifying mobility and heating

C) Potential of Renewable Energies estimated for Germany

- Solar energy
- Wind energy
- Water: Hydro power, wave energy, tidal power, osmosis, etc.
- Biomass
- Geothermal energy

D) Group work and presentation

- Energy consumption in the USA (one group)
- Estimates for the potential of renewables in the USA (several groups)

E) Conclusions

- A useful agenda for Germany and the USA

Course Learning Objectives and Expected Outcomes:

- Methodology of simple “back of the envelope” estimates to gain insights into complex systems
- Understanding the energy needs of our society in different areas
- Identifying potential options to save energy and evaluating their impact
- Identifying the renewable energy sources with the best potential for different world regions
- Understanding the possible contribution of all renewable energy sources to our energy production
- Understanding the limited amount of renewable energy sources
- Recognising “green wash” and distinguishing it from useful undertakings
- Understanding the steps necessary to convert our society into a sustainable society in terms of energy

Prerequisites:

- Any engineering or physical science major
- Multidisciplinary course focusing on simple physics to gain valuable insights into the consumption of energy and renewable energy sources

Recommended reading:

- D. MacKay: “Sustainable Energies – without the hot air”

Teaching methods:

- Blending of lecture presentations with in-class and external group exercises

Assessment methods:

- 40% Current topics student presentations

- 60% Final Exam

Language of instruction:

- English

Name of lecturers:

- Prof. Dr. Christian Holler (HM)
- Prof. Dr. Art MacCarley (California Polytechnic)