Course description

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

Hours per week: 22h/week, 2 weeks

Number of credits recommended/ work load: a) 44 contact hours

b) 3 US Quarter credits

c) 4 ECTS credits

Course description:

The Potential of Renewable Energies gives a broad overview of our energy consumption and the potential production using clean or renewable sources. Using simple physics to understand our energy consumption (at the consumer, industrial, and government level) and to estimate the potential of environmental energies gives students the ability to participate in the discussions on energy in a constructive manner. Understanding the underlying facts about energy – consumption and production - is the basis for political decisions that will shape our future.

Course Content:

A) Motivation

- Objective approach to understanding current energy consumption, the finiteness of fossil energy, and measure the potential of renewable energy. Focus on Germany and California with a global perspective.
- Identifying green wash
- The impact of fossil energy on our world

B) Outline

- Finiteness of fossil/uranium
    1. What's left
    2. Rate of replenishment
    3. Longtermism
- Limited potential of renewable energy
    1. Sources
        1. Solar (photovoltaic, wind, biomass, etc.)
        2. Tidal
        3. Geothermal

2. RoI on energy and capital

- Estimate energy consumption for Germany and California
  1. Direct
     1. Household
        1. Heating, light, cooling, electronics, water, cooking.
     2. Transport
        1. People, food, goods
        2. Trains, planes, cars, trains
        3. Sidewalks, train tracks, roads, airports
  2. Manufacturing and industry (imported goods as well)
     1. Changes in process required by shift to renewable
     2. Carbon emissions in manufacturing (when using renewable *energy* sources)
  3. Food and agriculture

D) Group work and presentation

- Energy consumption in home state/country/area.

E) Conclusions

- A useful agenda for Germany and the USA
- Energy descent

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 the renewable energy sources with the best potential for different world regions
- Identifying potential options to reduce energy use and evaluating their impact
- 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:

- Cooper Minehart (California Polytechnic, San Luis Obispo)