

ChE-304

Energy systems engineering

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Cursus	Sem.	Type
Chemical Engineering	BA6	Obl.
Electrical and Electronical Engineering	MA2, MA4	Opt.
Energy Science and Technology	MA2, MA4	Opt.
HES - CGC	E	Obl.
Minor in Engineering for sustainability	E	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	During the semester
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

This course will provide a toolkit to students to understand and analyze sustainable energy systems. In addition, the main sustainable energy technologies will be introduced and their governing principles explained.

Content**1. Basics of energy analysis**

- **Technical aspects of energy: Thermodynamics of energy conversion**
- **Systems modeling**

2. Global energy analysis

- **Energy: issues, definitions and resources**
- **Energy economics**

3. Sustainable energy technologies (the technologies covered will vary year to year depending on guest lecturers)

- **Energy Storage, management and distribution**
- **Fossil energy and carbon sequestration**
- **Geothermal energy**
- **Hydropower**
- **Wind energy**
- **Solar energy**
- **Biomass conversion and bioenergy**

Learning Prerequisites

Required courses

Thermodynamics, General Chemistry

Recommended courses

Introduction to Chemical Engineering I and II

Learning Outcomes

By the end of the course, the student must be able to:

- Analyze a renewable energy system
- Describe the working principles of the principle sustainable energy technologies
- Describe the main issues pertaining to the global energy supply
- Analyze the thermodynamics of a sustainable energy system
- Perform a simple systems analysis of a renewable energy system
- Analyze the economics of a sustainable energy system

Teaching methods

Course with examples, case studies and exercises

Assessment methods

Continuous: one in-class exam and a project to be turned in.

Resources

Moodle Link

- <https://go.epfl.ch/ChE-304>