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. |

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|---|---|
| Language of teaching | English |
| Credits | 3 |
| Session | Summer |
| Semester | Spring |
| Exam | Written |
| 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 pertainaing to the global energy supply
- Analyze the thermodynamics of a sustainable enrgy system
- Perform a simple systems analysis of a renewable energy system
- Analyze the economics of a sustinable 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