ENG-410

# Energy supply, economics and transition

Ballif Christophe, Binder Claudia R., Thalmann Philippe

| Cursus | Sem. | Type |
|---|---|---|
| Energy Science and Technology | MA2, MA4 | Obl. |
| Managmt, tech et entr. | MA2, MA4 | Opt. |

| | |
|---|---|
| Language of teaching | English |
| Credits | 2 |
| Session | Summer |
| Semester | Spring |
| Exam | Written |
| Workload | 60h |
| Weeks | 14 |
| **Hours** | **2 weekly** |
| Lecture | 2 weekly |
| **Number of positions** | |

## Summary

This course examines the supply of energy from various angles: available resources, how they can be combined or substituted, their private and social costs, whether they can meet the demand, and how the transition to a renewable energy system can be fostered.

## Content

**Energy resources (Christophe Ballif)**

- Available resources and their properties (finite resources like fossil, nuclear fuel, vs hydro, non-hydro, renewable resources such as solar, wind, geothermal biomass)
- General aspects of energy management (grid transport, fossil fuel transport, heat and electricity storage, power-to-gas, heat pumps, district heating and cooling…..), including costs aspects and perspectives

**Energy economics (Philippe Thalmann)**

- The Grand Challenge: Reconciling demographic and economic growth with the limits of our planet
- Decoupling: What it means, what it takes; green growth
- Markets: How they work, why we like them, what can go wrong with them
- Policy: International climate policy; economics of innovation
- Wrap up: energy, human needs and well-being

**Energy transition (Claudia R. Binder)**

- Governance perspectives and social-technical dimensions
- Energy system transitions (from a fossil fuel to a CO2 neutral system) as socio-technical change processes
- Insights into drivers and barriers for the socio-technical transition of the energy system
- Routines, visions and disruptive change(s) from a resilience perspective
- Governance transitions of urban utilities

Case study: a CO2-neutral energy system in Switzerland

## Keywords

Energy resources
Energy supply
Energy prices
Energy costs

Energy transition
Renewable energy
Decarbonisation
Decoupling
Green growth
Sustainability

## Learning Outcomes

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

- Critique theories and proposals related to energy supply
- Propose various scenarios for energy systems and their evolution
- Reason on technical, social, political and economic issues
- Explain the relationships between physical energy resources and energy supply
- Differentiate between scientific and propaganda arguments
- Restate concepts and mechanisms seen in class

## Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Set objectives and design an action plan to reach those objectives.
- Communicate effectively with professionals from other disciplines.
- Access and evaluate appropriate sources of information.

## Teaching methods

In-depth teaching and educational support.

## Assessment methods

Written exam

## Supervision

| | |
|---|---|
| Office hours | No |
| Assistants | Yes |
| Forum | Yes |

## Resources

### Moodle Link

- https://moodle.epfl.ch/course/view.php?id=16154

### Videos

- http://Many of the courses of 2020 are available as videos