

ChE-414

**Thermodynamics of energy conversion and storage**

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Cursus	Sem.	Type
Energy Science and Technology	MA2, MA4	Opt.
Ing.-chim.	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
Lecture	2 weekly
Exercises	1 weekly
<b>Number of positions</b>	

**Summary**

The course is an introduction to the energy conversion. It focusses on the thermodynamics of the engines and systems for the conversion of energy from fossil fuels and renewable resources. The relevant aspects of modern energy conversion are treated and the potentials and limitations are estimated.

**Content**

- Basic introduction into thermodynamics of energy conversion
- Energy demand and energy economy
- Resources and climate change
- Internal combustion engines (piston engines)
- Turbines
- Nuclear power station
- Renewable energy sources
- Solar thermal energy conversion
- Wind power
- Hydro power
- Photovoltaics
- Geothermal energy
- Tides • Storage of renewable energy

**Keywords**

Energy conversion  
Efficiency  
Resources  
Renewable energy

**Learning Outcomes**

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

- Work out / Determine the potential and limitations of the resources
- Describe the various energy conversion technologies
- Explain the thermodynamics of the energy conversion devices
- Analyze the relevant chemical reactions
- Compare technologies and estimate the potential
- Assess / Evaluate the performance of various energy conversion technologies

**Teaching methods**

Ex cathedra using Powerpoint slides. Examples will be shown to illustrate theory.

### **Expected student activities**

Taking notes in the course hours. Solve the exercises.

### **Assessment methods**

One final written exam.

### **Resources**

#### **Bibliography**

Henning STRUCHRUP, "Thermodynamics and energy conversion", Springer (PDF CHF 54.-  
<http://www.hanser-elibrary.com/isbn/9783446427327>)

David JC McKay, "Sustainable Energy - without the hot air", <http://www.withouthotair.com/cft.pdf>

#### **Ressources en bibliothèque**

- [Thermodynamics and energy conversion / Struchup](#)
- [Sustainable Energy - without the hot air / MacKay](#)

#### **Notes/Handbook**

Students have access to the slides few days before each lesson.

#### **Moodle Link**

- <https://go.epfl.ch/ChE-414>