

## Sustainable Energy and Rational Use of Energy (E039060)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 4.0**

**Study time 120 h**

**Course offerings and teaching methods in academic year 2024-2025**

A (semester 2)

English

Gent

lecture

excursion

**Lecturers in academic year 2024-2025**

Beeckman, Jeroen

TW06

lecturer-in-charge

**Offered in the following programmes in 2024-2025**

**crdts**

**offering**

Bachelor of Science in Bioscience Engineering

4

A

Master of Science in Teaching in Science and Technology(main subject Chemistry)

4

A

Master of Science in Teaching in Science and Technology(main subject Physics and Astronomy)

4

A

Master of Science in Chemistry(main subject (Bio)Organic and Polymer Chemistry)

4

A

Master of Science in Chemistry(main subject Analytical and Environmental Chemistry)

4

A

Master of Science in Engineering: Architecture(main subject Architectural Design and Construction Techniques)

4

A

Master of Science in Electrical Engineering (main subject Communication and Information Technology )

4

A

Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)

4

A

Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)

4

A

Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)

4

A

Master of Science in Electromechanical Engineering(main subject Maritime Engineering)

4

A

Master of Science in Chemistry(main subject Materials and Nano Chemistry)

4

A

Master of Science in Electromechanical Engineering(main subject Mechanical Construction)

4

A

Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)

4

A

Master of Science in Engineering: Architecture(main subject Urban Design and Architecture)

4

A

Master of Science in Bioscience Engineering: Chemistry and Bioprocess Technology

4

A

Master of Science in Chemical Engineering

4

A

Master of Science in Chemical Engineering

4

A

Master of Science in Civil Engineering

4

A

Master of Science in Civil Engineering

4

A

Master of Science in Engineering Physics

4

A

Master of Science in Engineering Physics

4

A

Master of Science in Fire Safety Engineering

4

A

Master of Science in Materials Engineering

4

A

Master of Science in Physics and Astronomy

4

A

Master of Science in Sustainable Materials Engineering

4

A

Exchange Programme Architecture

4

A

**Teaching languages**

English

## Keywords

Sustainable energy, renewable energy, rational energy use

## Position of the course

The aim of this course is to gain insight in production and use of energy. Beside the technical aspects, also environmental and economical aspects are treated. The production of electrical and thermal energy with fossil and nuclear fuels, as well as with renewable energy (wind, solar energy, biomass, hydro), is dealt with. The total energy principle is also highlighted. In a second part methods to prevent use of energy are highlighted.

## Contents

- Energy production: Fossil fuels, Nuclear fuels, Wind energy, Solar energy, Biomass, Hydro energy, Total energy principle, Fuel cells
- Rational use of energy: Energy flow, Use of energy in buildings, Use of energy in production processes, Remote heating, Energy storage, Energy use in transport

## Initial competences

Chemistry and Physics (Bachelor of Engineering)

## Final competences

- 1 To demonstrate the importance of sustainable energy with respect to the amount of fossil energy available, environmental effects and the climate change.
- 2 To describe which forms of (non-)sustainable energy are available and to estimate in which quantity they are available.
- 3 To describe the scientific principles behind the conversion of sustainable energy sources (solar irradiation, wind, ...) into useful energy (electricity, mechanical power, ...).
- 4 To predict and to calculate the energy production of sustainable energy installations (photovoltaic, wind, hydro, ...).
- 5 To explain the need and the problems of energy storage with respect to sustainable energy production.
- 6 To list a number of ways to reduce energy use through the rational use of energy.
- 7 To predict and calculate the reduction in energy use by switching to a more rational use of energy.

## Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

## Conditions for exam contract

This course unit cannot be taken via an exam contract

## Teaching methods

Excursion, Lecture

## Extra information on the teaching methods

Classroom lectures; Seminars; Plant visits; Presentations by external speakers

## Study material

Type: Syllabus

Name: Course notes for Sustainable Energy and Rational Use of Energy

Indicative price: € 7

Optional: no

Language : English

Number of Pages : 200

Available on Ufora : Yes

Online Available : No

Available in the Library : No

Available through Student Association : Yes

## References

Nicholas Jenkins, Janaka Ekanayake, *Renewable Energy Engineering*. Cambridge University Press (2017). <https://dx.doi.org/10.1017/9781139236256>  
MacKay, D. J. C. (2009). *Sustainable energy - without the hot air*. Cambridge: UIT. ISBN: 978 19 068 6001 1. Free download via <https://withouthotair.com>

**Course content-related study coaching**

Student coaching and assistance: the lecturer and his/her assistants are available during or in between lectures.

**Assessment moments**

end-of-term assessment

**Examination methods in case of periodic assessment during the first examination period**

Written assessment open-book

**Examination methods in case of periodic assessment during the second examination period**

Written assessment open-book

**Examination methods in case of permanent assessment****Possibilities of retake in case of permanent assessment**

not applicable

**Extra information on the examination methods**

During examination period: written open-book exam

**Calculation of the examination mark**