

## Physical Chemistry (E029040)

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

**Credits 6.0** **Study time 180 h**

**Course offerings and teaching methods in academic year 2025-2026**

A (semester 2)	Dutch	Gent	
B (semester 2)	English	Gent	lecture seminar

**Lecturers in academic year 2025-2026**

Moreels, Iwan WE06 lecturer-in-charge

**Offered in the following programmes in 2025-2026**

	<b>crdts</b>	<b>offering</b>
<a href="#">Bridging Programme Master of Science in Engineering Physics</a>	6	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)</a>	6	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)</a>	6	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Maritime Engineering)</a>	6	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Construction)</a>	6	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	6	B
<a href="#">European Master of Science in Nuclear Fusion and Engineering Physics</a>	6	B
<a href="#">Master of Science in Engineering Physics</a>	6	A
<a href="#">Master of Science in Engineering Physics</a>	6	B
<a href="#">Master of Science in Photonics Engineering</a>	6	B
<a href="#">Master of Science in Physics and Astronomy</a>	6	B

**Teaching languages**

English, Dutch

**Keywords**

chemical thermodynamics, chemical kinetics, chemical potential, chemical equilibrium, equilibrium at surfaces, electrochemical equilibrium, electron transfer

**Position of the course**

The physical chemistry course aims at teaching students important aspects of physical chemistry (chemical thermodynamics and kinetics, thermodynamics at surfaces and interfaces, electrochemistry). The course focuses on a solid knowledge of the basic principles and insight into their applications. Important are the interpretation of thermodynamic quantities on a molecular level and a knowledge of theoretical models and their experimental basis. The course aims at stimulating a scientific way of thinking, focusing on the construction of models starting from experimental observations.

**Contents**

- Principles of chemical thermodynamics: Gases - Intermolecular forces, Energy - Thermochemistry, Entropy, Gibbs free energy - Change and equilibrium
- Uncharged systems: Equilibrium in one-component systems, Equilibrium in binary mixtures, Chemical equilibrium, Equilibrium at surfaces
- Charged systems: Ionic solutions, Charged interfaces, electron transfer
- Kinetics: transition state theory, reaction kinetics in the gas phase, reaction kinetics on solid surfaces

### Initial competences

physics I, physics III, chemical thermodynamics I

### Final competences

- 1 Interpret important quantities of chemical thermodynamics and their molecular background: enthalpy, entropy, free energy, chemical potential.
- 2 To have insight in the thermodynamic and statistical meaning of entropy.
- 3 Determine equilibrium lines on phase diagrams, and equilibrium in binary mixtures.
- 4 Connect chemical equilibrium with reaction kinetics.
- 5 Calculating enthalpy and entropy changes of physicochemical reactions in a practical context (chemical reactions, phase transitions, electrodes and charge transport).

### 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

Seminar, Lecture, Independent work

### Study material

Type: Syllabus

Name: Physical Chemistry for Engineers  
Indicative price: Free or paid by faculty  
Optional: no  
Language : English  
Available on Ufora : Yes  
Online Available : Yes  
Available in the Library : No  
Available through Student Association : No

Type: Syllabus

Name: Chemical Kinetics for Engineers  
Indicative price: Free or paid by faculty  
Optional: no  
Language : English  
Available on Ufora : Yes  
Online Available : Yes  
Available in the Library : No  
Available through Student Association : No

Type: Slides

Name: Lecture slides  
Indicative price: Free or paid by faculty  
Optional: no  
Language : English  
Available on Ufora : Yes  
Online Available : Yes  
Available in the Library : No  
Available through Student Association : No

### References

- P.W. Atkins, J. de Paula, 'Physical Chemistry', Oxford University Press (2001)
- R.J. Silbey, R.A. Alberty, M.G. Bawendi, Physical Chemistry, Fourth Edition, Wiley (2004)

### Course content-related study coaching

#### Assessment moments

end-of-term assessment

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

Written assessment with open-ended questions, Written assessment open-book

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

Written assessment with open-ended questions, 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**

Theory exam: written closed-book exam.

Excercise exam: written open-book exam.

**Calculation of the examination mark**

Special conditions: two exams, theory and excercises. Distribution of scores: 12 for the theory, 8 for the excercises.