



# Course Specifications

Valid as from the academic year 2015-2016

## Organic Chemistry 2: Advanced Reactivity (O000092)

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

**Credits** 5.0      **Study time** 150 h      **Contact hrs** 60.0 h

**Course offerings and teaching methods in academic year 2015-2016**

A (semester 2)	practicum	20.0 h
	guided self-study	10.0 h
	lecture	30.0 h

**Lecturers in academic year 2015-2016**

Heynderickx, Philippe      LA07      lecturer-in-charge

**Offered in the following programmes in 2015-2016**

	crdts	offering
Bachelor of Science in Food Technology	5	A
Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology	5	A
Bachelor of Science in Environmental Technology	5	A
Bachelor of Science in Molecular Biotechnology	5	A

**Teaching languages**

English

**Keywords**

Organic chemistry

**Position of the course**

The course of 'Organic Chemistry II' is a continuation of 'Organic Chemistry I'. Topics such as electrophilic addition reactions, electrophilic aromatic substitution reactions, nucleophilic substitution reactions,  $S_N1$  and  $S_N2$ , and elimination reactions E1 and E2 are retaken in a much deeper detail than in 'Organic Chemistry I'. Also, the stability of organic compounds, intermolecular reactions and interactions are addressed. The central part of the course comprises the study of different mechanisms of chemical reactions, which are linked to functional groups. A good knowledge of chemical reactivity is essential in the course. This knowledge is then applied to a number of classes of compounds, natural products and industrial materials. Attention is paid to the relevant link between organic chemistry and everyday's life and agrochemical and pharmaceutical sciences. Additionally, attention is paid to the industrial preparation of the most important industrial (intermediate) compounds (e.g., benzene, acetaldehyde...) and the principles of oil refinery. Natural products, an introduction on the use of dyes and synthesis and applications of the most common polymers are included. Laboratory experiments help the student to acquire the needed insights in Organic Chemistry. Priority is given to the understanding of the chemical reactivity of the compounds that are used and their properties. The different mechanisms of chemical reactions are illustrated by means of selected practical exercises. These experiments are accompanied by an introduction concerning safety and toxicology and a theoretical explanation of the different exercises.

**Contents**

1. Theory:
  - Repetition of reactions from 'Organic Chemistry I'
  - Nomenclature of polycyclic hydrocarbons (e.g. spiro compounds, terpenes, steroids...)
  - Alkenes and alkynes: reactions (addition reactions, Markovnikov, hydroboration)
  - Aromatic compounds (electrophilic substitution reactions in five- and six-membered

rings)

- Substitution and elimination reactions ( $S_N1$  and  $S_N2$ ; E1 and E2)
  - Stability of organic compounds
  - Intermolecular reactions
  - Retrosynthesis
  - Reactions mechanisms, applied to the synthesis/retrosynthesis of halogen compounds, alcohols, phenols, ethers, amines, carbonyl compounds, carbon-nitrogen double and triple bonds, heterocyclic aromatic compounds, sulphur and phosphorous compounds...
  - Natural products
  - Industrial preparation of the most important industrial (intermediate) compounds (e.g., benzene, acetaldehyde...)
  - Principles of oil refinery
  - Dyes and pigments
  - Polymers (synthesis and properties)
2. Practical sessions:
- 1.3-diphenyl-2-propenone (aldol condensation)
  - Isoamyl acetate (esterification, cfr. aroma products)
  - Diphenylmethanol (reduction)
  - Aspirine (analgetic)
  - Biodiesel (re-esterification)
  - Phenoxyacetic acid (cfr. Herbicides)
  - Methyl orange

### Initial competences

Competences acquired in Organic Chemistry 1.

### Final competences

#### *Knowledge*

Concepts: nomenclature, molecular structure of C bonds, electrophilic addition reactions, electrophilic aromatic substitution reactions, nucleophilic substitution reactions, elimination reactions, stability of organic compounds, acid and bases. Insights: relevant link between organic chemistry and everyday's life and agrochemical life, detailed notion in organic molecules, with their elements, bonds, steric structure, stability, mutual interaction; elaboration of reaction mechanisms; interpretation of physical and chemical properties of functional groups; good knowledge of chemical reactivity.

#### *Skills*

Methods: experience in organic chemistry laboratory, handling of organic compounds (safety), knowledge of safety principles, performing simple experiments and purification methods.

### 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

Guided self-study, lecture, practicum

### Learning materials and price

Syllabus 'Organic Chemistry I and II' by Prof. Heynderickx

### References

Hart H., Hadad C. M., Craine L. E., Hart D. J. Organic Chemistry, A Short Course, 13<sup>th</sup> edition. Houghton Mifflin Company.  
Wade, L.G. (2003), "Organic chemistry" (8<sup>th</sup> edition), Pearson education inc.  
References within the syllabus

### Course content-related study coaching

### Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination with open questions, written examination with multiple choice questions, oral examination

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

**Examination methods in case of permanent evaluation**

Participation, job performance assessment, report

**Possibilities of retake in case of permanent evaluation**

examination during the second examination period is possible in modified form

**Calculation of the examination mark**

Written examination with open questions and multiple choice questions (60 + 10%)

Performance assessment (practical + attitude) (10%)

Lab reports (20%)