GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Advanced Macromolecular Chemistry (C004126)

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 2024-2025

A (semester 1)	English	Gent	lecture

Lecturers in academic year 2024-2025

Du Prez, Filip	WE07	lecturer-in-charge
Dubruel, Peter	WE07	co-lecturer
Hoogenboom, Richard	WE07	co-lecturer

Offered in the following programmes in 2024-2025	crdts	offering
Master of Science in Teaching in Science and Technology(main subject Chemistry)	6	A
Master of Science in Chemistry(main subject (Bio)Organic and Polymer Chemistry)	6	A
Master of Science in Materials Engineering	6	A
Master of Science in Sustainable Materials Engineering	6	A
Exchange Programme in Chemistry (master's level)	6	A

Teaching languages

English

Keywords

Polymers, polymer chemistry, polymerisations, natural polymers, non-covalent interactions, responsive materials, adaptive materials, supramolecular polymers.

Position of the course

This course starts from the content of the bachelor course 'Polymer Chemistry' . The student will get acquainted with the latest developments in the area of polymer chemistry, polymer modification methods, complex polymer architectures and new generation of polymer materials. The student will also learn how to deal with sustainable aspects in this context. Advanced topics include two important aspects of polymer chemistry and materials science: namely polymers for biomedical applications and supramolecular interactions as basis for adaptive and responsive materials, including molecular machines.

Contents

Living and controlled radical and cationic polymerizations; dendrimers and hyperbranched polymers; copolymers (random, block and graft); most efficient chemical transformations of synthetic and natural polymers (eg. 'click' chemistry); polymers from renewable resources; determination of absolute molecular weights; self-healing polymer materials; polymeric capsules; rational design of light-responsive polymers and hydrogels; applications of light-responsive polymers; other recent developments in polymer chemistry.
biomaterials: definitions and classification, biodegradable polyesters, hydrogels, biocompatibility, basic applications of biomaterials; Supramolecular materials: Ionic interactions; multiple hydrogen bonding arrays; metal coordination; supramolecular polymers; principles of aqueous self-assembly; molecular machines.
The modules advanced polymer chemistry and macromolecular chemistry are accessible as Advanced Topics in Chemistry.

Initial competences

Having followed the course 'introduction to polymer science or being acquainted

with the competences that were aimed for in this course.

Final competences

1 Having critical insight in the different methods to prepare polymers.
2 Being able to discuss relationships between different polymerisation methods.
3 Knowledge of parameters that control the polymerisation reactions.
4 Getting acquainted with methods to build up complex polymer architectures.
5 Being open for new scientific developments within the rapidly developing area of polymer chemistry.
6 Detailed knowledge and understanding of recent developments in at least one research area in the field of chemistry.
7 1 Advanced knowledge of concepts, theories and principles of inorganic, physical, organic, macromolecular and analytical chemistry and apply these in a creative fashion for complex problems.
8 Knowledge of different types of functional polymers and their properties and applications.
9 Knowledge of aspects related to processing of polymers for biomedical applications.
10 Knowledge of supramolecular polymers, responsive polymers, aqueous self-assembly and molecular machines.

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

Lecture

Extra information on the teaching methods

The course unit will be organized on-campus under the form of interactive lectures with the three teachers. The exact schedule of which partim will be covered within the allocated hours, will be announced to the students via Ufora.

Study material

Type: Slides

Name: Slides'
Indicative price: Free or paid by faculty
Optional: no
Additional information: The course content will be made available via Chemica and/or Ufora. Slides will be available via Ufora.

References

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

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

Written assessment

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

The evaluation will encompass a written evaluation comprised of questions from the three partims.

Calculation of the examination mark

The periodic evaluation counts for 100%.
The final score distribution will be calculated based on the partial scores of three

partims of the periodic evaluation:

- 50% advanced polymer chemistry (final competences 1-5)
- 25% Biomedical polymers (final competences 5-9)
- 25% Supramolecular polymer, responsive polymers and molecular machines (final competences 5, 6, 7, 8, 10)