Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course Specifications
Valid as from the academic year 2019-2020

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

Credits 6.0 Study time 180 h Contact hrs 60.0 h

Course offerings and teaching methods in academic year 2020-2021

B (semester 2) Dutch Kortrijk

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<tr>
<th>Lecture</th>
<th>Practicum</th>
<th>Excursion</th>
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<tr>
<td>24.0 h</td>
<td>24.0 h</td>
<td>12.0 h</td>
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Lecturers in academic year 2020-2021

Dumoulin, Ann LA24 lecturer-in-charge

Offered in the following programmes in 2020-2021 credits offering

Bachelor of Science in Biobindustrial Sciences 6 B

Teaching languages

Dutch

Keywords

Polymers, polymerisation, additives and modifiers, physical characterization, chemical characterization, polymer processing, extrusion, injection moulding

Position of the course

This course provides an overview of the different types of polymers and the methods of synthesis. This is followed by the chemical and physical characterization of the polymers. The third part treats the processing methods.

Contents

Theory

Part I: Polymer chemistry
1 Introduction to polymers
2 Chemistry of macromolecules
3 Step-growth polymerization
4 Chain-growth polymerization
5 Polymerization techniques
6 Additives and modifiers for plastics

Part II: Physical and chemical characterization of polymers

- Physical properties
- Phases and phase transition: amorphous, crystalline, determination of crystallinity (DSC, DTA)
- Thermal properties: heat conduction, thermal expansion, temperature resistance (measurement methods)
- Mechanical properties: stiffness, creep and relaxation, tensile strength, impact strength, elasticity
- Electrical properties
- Properties of bulk polymers: viscoelasticity
- Chemical characterization
- Identification: primary methods, IR-spectroscopy, Raman spectroscopy, NMR-spectroscopy, UV/VIS-spectroscopy, Fluorescence, DSC, mass spectrometry, chromatography

Part II: Polymer processing

- Extrusion
- Injection moulding
- others
- Prevention, health and environment

(Approved)
Practicum

Reaction kinetics of PAA in water: Influence of initiator concentration, monomer concentration or the temperature on the polymerization of acrylamide. The procedure is described in an accompanying article. The purpose of this part is to translate the method into Dutch.

Characterization of PVC, PET and PE: MFI measurement of PE or PVC, quantitative (Soxhlet) and qualitative plasticizer analysis (FTIR) on some PVC films, and elemental analysis: measurement of Zn in an unknown sample using Spectroscopy.

Syntheses: Polymerization of acrylamide in water. Determination of the intrinsic viscosity, synthesis of a hydrogel of acrylamide and bis-acrylamide, and swell and transport properties of hydrogels.

Excursion

Guided visit(s) to companies active in polymer producing, processing industry and/or suppliers of analysis instruments.

Initial competences

The course builds on certain learning outcomes of the course units 'Organic Chemistry I' and 'Organic Chemistry II'.

Final competences

1. The student has a thorough knowledge and understanding of the concepts of polymer chemistry, the chemical and physical characteristics of plastics and the various techniques used in polymer processing.

2. The student has practical experience (team work) with laboratory scale synthesis, physical and chemical characterization of plastics and the plastics processing: injection moulding and extrusion.

3. The student can independently search for scientific and technical information (scientific literature, application notes, standards), communicate the methods and results in a written report and oral presentation.

4. The student has attention for the sustainable and safe use of plastics.

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, practicum

Extra information on the teaching methods

Lectures with powerpoint presentation and coached exercises
Hands-on lab in small groups
Excursion to Flanders' Plastic Vision or Campus Schoonmeersen and local plastic processing companies
The students write a paper on a polymer covering all aspects from the course.

Learning materials and price

Dutch course: €18
Practicum notes
Additional information on the digital learning environment.

References

See course text.

Course content-related study coaching

The teaching staff (both professor and teaching assistants) can always be contacted to solve problems. Minerva will be used to post additional information.

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, oral examination.

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

Written examination with open questions, oral examination.

(Approved)
Examination methods in case of permanent evaluation
Skills test, job performance assessment, report

Possibilities of retake in case of permanent evaluation
examination during the second examination period is possible in modified form

Extra information on the examination methods
periodic evaluation: written preparation of examination with open questions and exercises followed by oral discussion, project review
permanent evaluation: evaluation of attitude, knowledge, technical skills and communication skills during the hands-on lab sessions.

Calculation of the examination mark
First examination period
periodic evaluation (theory): 50%
permanent evaluation: 50%

Students who eschew (part of) non-period aligned evaluations for this course may be failed by the examiner

Second examination period
periodic evaluation: 50%
permanent evaluation: 10% lab exam, 40% score from the first examination period.

In order to pass, one has to attain a score of at least 8/20 for both periodic and permanent evaluation. If this condition is not fulfilled, and when the calculated score is 10/20 or more, the student may be failed by the examiner and gets a score of 9/20. This applies to both periods.

(Approved)