COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biodegradable and compostable materials [S1TOZ1>MBiK]

Course

Field of study
Circular System Technologies

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

The student starting this course should have knowledge of the basic issues of organic chemistry as well as chemistry and technology of polymers.

Course objective

To acquaint students with the concept of sustainable development of polymer materials, the processes of environmental degradation of polymer materials, types of biodegradable polymers and the basics of biodegradability of polymer materials.

Course-related learning outcomes

Knowledge:
the student has the knowledge to understand the phenomena and changes occurring in the processes of environmental degradation of plastics (kw_02). the student has knowledge of natural and biodegradable polymers (kw_04). the student has knowledge of selected monomers used for the synthesis of biodegradable polymers, methods of obtaining and processing biodegradable plastics (kw_10). the student has knowledge of testing methods, standards and measuring devices used to study the biodegradation processes of polymers (kw_11). the student has basic knowledge about the

life cycle of biodegradable polymers and plastics (k_w12), as well as knowledge about development trends and the latest achievements in the field of biodegradable polymers and plastics (k_w13).

Skills:
the student is able to obtain information from literature, databases and other sources, also in english (k_u1).

Social competences:
the student objectively assesses the level of his knowledge in the field of biodegradable polymers and understands the need of further continuous education in area of environmental degradation of polymers (k_k05). the student is aware of the negative impact of polymeric materials on the natural environment (k_k10).

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows: Stationary: A written test consisting of 3 - 5 open-ended questions concerning the issues presented in the lecture (the student obtains a pass by achieving at least 51% of the points) or in the form of written work. Online: a final test consisting of 20 - 30 questions (>50% closed questions) concerning the issues presented in the lecture (the student obtains a pass by achieving at least 51% of the points) on the eKursy platform.

Programme content

Biopolymers, environmental degradation, biodegradation, compostability..
Mechanisms of degradation of polymeric materials. Processing methods and application of biodegradable polymers.

Course topics

The lecture covers the following topics:
Introduction: general concepts and definitions (biopolymers, environmental degradation of polymeric materials, biodegradation, compostability).
Mechanisms of degradation of polymeric materials: microbiological, aerobic and anaerobic biodegradation. Factors influencing the biodegradation of polymeric materials and accelerating it.
Methods, conditions, standards of plastics composting, compostable materials marking, compost quality standards, compost use.
Types of biodegradable polymers: natural polymers (polysaccharides and their modification products - starch, cellulose, chitosan), polymers from renewable resources (microbiological - PHA, synthetic - PLA, PGA), synthetic polymers from fossil and/or renewable resources (PCL, PEA , PBSA, PBAT, PVA).
Processing methods and application of biodegradable polymers. Types of additives used for biodegradable plastics.
Fundamentals of plastics biodegradability: testing methods, standards and certification procedures (conditions: aerobic water, compost, soil, water anaerobic), standardization, measuring devices.

Teaching methods

Lecture: informative lecture with multimedia presentation.

Bibliography

Basic
1. Emo Chiellini, Roberto Solaro (Eds), Biodegradable polymers and plastics, Springer Science+Business Media New York, 2003
2. G. J. L. Griffin (Ed), Chemistry and Technology of Biodegradable Polymers, Chapman & Hall, London, 1994,
3. Catia Bastioli, Handbook of Biodegradable Polymers, 2nd Edition, Smithers Rapra technology Ltd, 2014
4. Ewa Rudnik, Compostable polymer materials, Elsevier Ltd, 2008
5. Abraham J. Domb, Joseph Kost, David M. Wiseman (Eds), Handbook of biodegradable polymers, Taylor & Francis Group, Amsterdam B.V., 1997

6. Syed Ali Ashter, Introduction to bioplastics engineering, Elsevier Inc., 2016
7. W.Szlezyngier, Tworzywa sztuczne t.3, FOSZE, Rzeszów 1999
Additional
1. Gerald Scott (Ed), Degradable Polymers, Principles and Applications, 2nd Edition, Springer Science+Business Media, B.V., 2002
2. Niranjan Karak, Vegetable oil-based polymers, Properties, processing and applications, Woodhead Publishing Limited, 2012

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	38	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	12	0,50