COURSE DESCRIPTION CARD - SYLLABUS

Course name
Advanced methods of biomaterials production [S2IChiP1-IBiB>ZMOB]

Course

Field of study
Chemical and Process Engineering

Year/Semester
1/1

Area of study (specialization)
Bioprocesses and Biomaterials Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
0

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

dr hab. inż. Łukasz Klapiszewski prof. PP
lukasz.klapiszewski@put.poznan.pl

Lecturers

Prerequisites

Knowledge of basic chemistry, organic chemistry and inorganic chemistry as well as knowledge and skills in the field of chemical technology and biomaterials.

Course objective

To get a theoretical and practical knowledge about advanced methods of biomaterials production, as well as organic and inorganic fillers used for this purpose. Understanding of the basic industrial processes and operations related to the prudction technology and the characteristics of composite materials. Ability to select raw materials and precursors for synthesis of a desired systems. Strengthening knowledge through practical exercises and projects.

Course-related learning outcomes

Knowledge:
k_w04. the student has knowledge about complex chemical processes, including the appropriate selection of materials, raw materials, apparatus and equipment for the implementation of chemical processes and characterization of the products obtained.
k_w07. the student has knowledge of the novel chemical and material technologies, including

technologies of advanced materials and nanomaterials, knows the current trends in the development of chemical industrial processes
k_w08. the student knows modern methods of testing the structure and properties of materials, necessary to characterize raw materials and products of the chemical and related industries.

Skills:
k_u02. the student has the ability to work in a team and lead a team.
k_u06. the student has the ability to present research results in the form of a report, dissertation or presentation.
k_u11. the student has the ability to adapt knowledge in chemistry and related fields to solve technological problems and to plan new industrial processes, not only chemical
k_u18. the student is able to critically evaluate the results of experimental research and determine the direction of further research leading to solving problems in the field of chemical engineering, process equipment and industrial technologies.

Social competences:
k_k01. the student understands the need for lifelong learning; can inspire and organize the learning process of others; is aware of the importance and non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for the decisions taken.
k_k03. the student is able to interact and work in a group, taking on different roles.
k_k07. the student is aware of the social role of a technical university graduate, and in particular understands the need to formulate and convey to the public, in particular through the mass media, information and opinions on the achievements of technology and other aspects of engineering activities; endeavors to provide such information in a manner that is universally understandable and gives reasons for different points of view.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Laboratory: Stationary form - oral answer or written test (3-5 questions) from the material contained in the exercises and the given theoretical issues; presence and realization of all laboratory exercises provided in the study program; grade from reports prepared after each exercise. A final grade will be given based on the average grades of the oral/written answers and reports for each exercise, divided by the number of exercises performed. Online form - oral answer and/or written test (10-20 closed, multiple choice test questions) from the material contained in the exercises, tutorial videos and the theoretical issues provided, conducted in the "live view" mode with the webcam turned on via eMeeting or Zoom platform during a direct conversation with the teacher and/or using the test module on the eKursy platform; online presence and completion of all laboratory exercises provided in the study program; grade from the reports prepared after each exercise and sent via the eKursy platform or by e-mail using the university"s e-mail system. A final grade will be given based on the average grade of the oral/written answers and reports for each exercise, divided by the number of exercises performed. Grade criteria: 3 - 50.1%-60.0%; 3.5 - 60.1%-70%; 4 - 70.1%-80.0%; 4.5 - 80.1%-90%; 5 - from 90.1%.
Project: Stationary form - presentation on the advanced method of obtaining a selected biomaterial and/or hybrid material. Criteria: form of presentation, self-presentation skills, active participation in discussions and answers to asked questions. Online form - presentation on the advanced method of obtaining a selected biomaterial and/or hybrid material, which students present in the "live view" mode with the webcam turned on via the eMeeting or Zoom platforms. Criteria: form of presentation, self-presentation skills, active participation in discussions and answers to asked questions.

Programme content

Program content includes:
1. Classification and characteristics of advanced methods of obtaining biomaterials.
2. Hybrid materials based on components of natural origin, mainly cellulose, lignin, chitin, starch etc.
3. Characteristics of functional biomaterials based on the latest research methods and measurement techniques.
4. The use of biomaterials and functional hybrid materials obtained with modern methods..

Teaching methods

Laboratory excercises, scientific project

Bibliography

Basic
1. G. Wypych, Handbook of fillers, ChemTec Publishing, 2010
2. G. Wilde, Nanostructured Materials, Elsevier, 2009
3. S. Kanwar, A. Kumar, Tuan Anh Nguyen, S. Sharma, Y. Slimani, Biopolymeric Nanomaterials : Fundamentals and Applications, Elsevier, 2022
4. W. Wagner, S. Sakiyama-Elbert, G. Zhang, M. Yaszemski, Biomaterials Science. An Introduction to Materials in Medicine, Elsevier, 2020
5. L.M. Pandey, A Hasan, Nanoscale Engineering of Biomaterials: Properties and Applications, Springer Nature, 2021
Additional
1. Research artciles related to the topic of course.
2. A. Jess, Chemical Technology: An Integral Textbook, Wiley VCH, 2012.
3. J.A. Moulijn, Chemical Process Technology, Wiley VCH, 2013.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00