



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

TECHNOLOGIES IN BIOECONOMY

### Course

Proposed by Discipline

Environmental engineering, mining and energy

Type of studies

Doctoral School

Form of study

full-time

Year/Semester

II/4, III/6

Course offered in

English

Requirements

elective

### Number of hours

Lecture

4

Tutorials

Projects/seminars

### Number of credit points

1

### Lecturers

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and

Energy

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Responsible for the course/lecturer:

### Prerequisites

Intermediate knowledge in chemistry, biotechnology and engineering.

### Course objective

Course includes a review of technologies applied in bioeconomy for biofuels and biochemicals production from biomass, wastewater and waste. Biorefinery concepts integrating variety of processes will be presented and discussed.



### Course-related learning outcomes

#### Knowledge

A PhD student who graduated from doctoral school knows and understands:

- 1) key developmental trends of disciplines of science in which education at the doctoral school takes place, [P8S\_WG /SzD\_W02]
- 2) basic principles of knowledge transfer to the economic and social sphere as well as those of commercialization of results of scientific activities and know-how related to these results. [P8S\_WK/SzD\_W07]

#### Skills

A PhD student who graduated from doctoral school can:

- 1) critically analyze and assess scientific research results, work of experts and other creative activities together with their contribution into knowledge development, [P8S\_UW/SzD\_U02]
- 2) take part in scientific discourse. [P8S\_UK/SzD\_U07]

#### Social competences

A PhD student who graduated from doctoral school is ready to:

- 1) acknowledge the importance of knowledge in solving cognitive and practical problems, [P8S\_KK/SzD\_K03]
- 2) think and act in an entrepreneurial manner. [P8S\_KO/SzD\_K06]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W02, W07	Participants' knowledge will be continuously verified during lectures based on activity in discussions and reading scientific papers. In addition, learning outcome will be verified by oral examination	Knowledge on technologies in bioeconomy
U02, U07	Discussion during the lectures based on the given scientific papers	Ability to take part in scientific discussion
K03, K06	Discussion during the lectures and oral examination	Understanding the impact of the biobased technologies on the economy



## Programme content

1. Key information on bioeconomy technologies.
2. Types and methods for substrate collection for biorefineries, fermentation processes including anaerobic digestion, thermal processes, methods for process integration, methods for process evaluation.

## Teaching methods

Interactive lecture including group discussions, conversations on the newest or most interesting/breakthrough scientific papers, conversations on new implemented biorefinery technologies.

## Bibliography

Basic

1. Liu Y., Cruz-Morales P., Zargar A., Belcher M.S., Pang B., Englund E., Dan Q., Yin K., Keasling J.D., Biofuels for a sustainable future. Cell 2021, 184. <https://doi.org/10.1016/j.cell.2021.01.052>

Additional

2. Shahab R.L., Brethauer S., Davey M., Smith A.G., Vignolini s., Luterbacher J.S., Studer M.H., A heterogeneous microbial consortium producing short-chain fatty acids from lignocellulose. Science 2020, 369 (6507), DOI: 10.1126/science.abb1214

## Breakdown of average student's workload

	Hours	ECTS
Total workload	9	1.0
Classes requiring direct contact with the teacher	4	0.5
Student's own work (literature studies, preparation for tutorials, project preparation) <sup>1</sup>	5	0.5

<sup>1</sup> delete or add other activities as appropriate