

Course title: BIOREFINERIES AND BIOPRODUCTS

ECTS credit allocation (and other scores): 3.0

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 30/15

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Type of classes: classes and lectures

Substantive content

CLASSES: Classification of biorefinery systems and determination their complexity. Determination of kinetic parameters of PHAs accumulation with mixed microbial cultures (laboratory classes). Technological concepts of sewage sludge composting, of anaerobic digestion of wastewater/wastes, of polyhydroxyalkanoates production with mixed microbial cultures.

LECTURES: Biorefineries – concepts and principles, classification and types, feedstocks processed, unit processes and operations, development trends. Composting – theoretical background, compost/humic substances as useful bioproducts. Anaerobic digestion – basic and principles, enhancing hydrogen and methane production technologies. Technological strategies for production of biodegradable polymers (polyhydroxyalkanoates).

Learning purpose: get the ability to select the concept of biorefineries for a specific type of substrates and products and get acquainted with the possibilities and technologies of recovery of different bioproducts from waste materials.

On completion of the study programme the graduate will gain:

Knowledge: fundamentals and principles of biorefinery design and operation; technological solutions for converting various types of waste biomass into products with utility value, uniform processes and technologies for obtaining useful bioproducts from waste.

Skills: characterization of the basic processes and operations in biorefineries; classification of biorefineries according to the type of substrates processed, bioproducts produced and process units used; selection and evaluation of technical solutions in the field of bioproduct production technologies; presentation and justification of the selection of proposed bioproduct technological concepts; performance of calculations of the technological concept of an exemplary biorefinery.

Social Competencies: recognize the need to recover resources from waste biomass and develop a circular economy

Basic literature: Ashok Pandey A., Rainer Höfer R., Taherzadeh M., Nampoothiri M., Larroche C. (Eds.), 2015, *Industrial Biorefineries and White Biotechnology*, 1st Edition, Elsevier. Aresta M., Dibenedetto A., Dumeignil F. (Eds.), 2012, *Biorefineries: An Introduction*, 1st Edition, De Gruyter. Bhaskar T., Pandey A., Mohan S.V., Lee D.-J., Khanal S.K. (Eds.), 201, *Waste Biorefinery: Potential and Perspectives*, 1st Edition, Elsevier. A.M. Martin (Ed.), 2012, *Bioconversion of waste materials to industrial products*, 2nd Edition, Springer. Publications about composting and compost by different authors available on Elsevier service, 2017-2022.



Supplementary literature: ---

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 49 (lectures, classes, consultations)

Student's independent work: 35 (preparing the lab report, studying for a colloquium, studying for the exam, performing calculations for technological concepts)