

BIOTECHNOLOGY

(2 ECTS) *Compulsory*

Responsible person: Dr. inż. Grzegorz S. Jodłowski

The aim of the subject is to acquire a fundamental knowledge on the biotechnology issues with special tension on biotechnology use in fuels processing and production or environmental protection. Students are introduced to the biochemistry and microbiology. They obtain the basic knowledge on bioreactors, fermentors and other equipment used in bioprocessing.

Learning outcomes: . Student should to know after the course:

- overall nomenclature and classification of living organisms;
- fundamentals of cell structure and functions;
- DNA, RNA and chosen nucleotides – structure and function;
- fundamentals of genetics and genomics;
- metabolism and metabolites – how it works;
- basics of Krebs and Calvin cycles;
- processes of respiration, aerobic and anaerobic fermentation;
- chosen applications of bioprocesses (use of different starting materials problems, microorganisms, technological regimes, after treatment):
 - alcohol fermentation,
 - biogas production,
 - lactic acid fabrication,
 - antibiotics and vaccines production,
 - bioremediation,
 - waste water treatment;
 - rules of the bioprocess optimization.

Course main content:

The course is built of two parts: lecture (15 h) and seminar (15 h)

Lectures:

Introduction to biotechnology; historical background, applications, biotechnology in power production and environmental protection. The methods of development of a biotechnology process: modernization, innovation, investigation, implementation, and optimization. Screening and improvement of bioprocess. Metabolism and metabolites. Industrial microorganisms. The terms of bioprocess: carrying; bioreactors, strains of microorganisms and raw material choice. Biocatalysis and enzymes. Septic safety. Selected bioprocesses in energy sector.

Seminars:

Fundamentals of biotechnology. The preparation of biomaterials (half-products): alcohols, polymers etc., energy media production (e.g. methane, methanol). Biomaterials conversion for energy production (e.g. MTBE, bioethanol, alga-fuel and biomass-hydrogen systems). Biotechnology in environmental protection: wastewater treatment; bio-filters, active sludge, wastes bio-utilization. Biosynthesis. Basics of bio-catalysis. Biogas production issues. GMO issues. Bio-indicators.

Literature:

Khan „Basic Concepts of Biotechnology”, Ukaz Publications 2006

C. Ratledge „**Basic Biotechnology**”, Cambridge University Press 2006

D. M. Mousdale „Biofuels Biotechnology Chemistry and Sustainable Development”, CRC Press Inc. 2008

G. Najafpour „**Biochemical Engineering & Biotechnology**”, Elsevier Science Publishers 2006

http://www.iea.org/publications/free_all.asp

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Assessment:

credit of the course

grade for the student presentation of chosen subject

Rules of credit: grade for the student presentation of chosen subject