

---

Course title: BIOTECHNOLOGIES FOR ENVIRONMENTAL SUSTAINABILITY

ECTS credit allocation (and other scores): 2.5

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: 34/11

Course coordinator/ Department and e-mail: Tomasz Pokój, Dr. Hab. Eng., associate Professor / Department of Environmental Biotechnology; tomasz.pokoj@uwm.edu.pl

Type of classes: classes and lectures

---

#### Substantive content

**CLASSES:** The effect of the C:N ratio in the culture medium on the efficiency of PHA accumulation in activated sludge – determination of kinetic constants, rates of substrate consumption and PHA accumulation, and PHA yield coefficient and volumetric productivity. Application of biosurfactants in soil washing system for heavy metals. The effect of operational conditions for removal of PAHs from soils using biosurfactants. The effectiveness of dye adsorption from aqueous solutions onto selected biosorbent.

**LECTURES:** Natural polymers for bioplastic production. Strategies for production of PHAs with pure cultures and mixed microbial consortia with the use of renewable waste materials as substrates. Properties and applications of PHAs. Soil bioremediation techniques. Application of biosurfactants for metal removal from soil. Application of biosorption for dyes removal from wastewater.

**Learning purpose:** Acquire knowledge on biological systems for protection and restoration of the environment.

---

On completion of the study programme the graduate will gain:

**Knowledge:** Basic knowledge of biodegradable polymer production, degraded soil bioremediation, and biosorbents.

**Skills:** Ability to perform and assess bioremediation and biosorption to protect and restore the environment.

**Social Competencies:** Willingness to cooperate in a team, playing different roles.

**Basic literature:** 1) Khan F.I., Husain T., Hejazi R. 2004. An overview and analysis of site remediation technologies. *Journal of Environmental Management* 71: 95-122. 2) Mulligan C.N. 2005. Environmental applications for biosurfactants. *Environmental Pollution* 133: 183-198. 3) Gupta V.K., Suhas. 2009. Application of low-biosorbents for dye removal – a review. *Journal of Environmental Management* 90: 2313–2342. 4) Chen G.Q., 2010. *Plastics from Bacteria. Natural Functions and Applications*. Springer-Verlag, Berlin Heidelberg, Germany.

**Supplementary literature:** 1) Padmavathiamma P. K., Li L.Y. 2007. Phytoremediation technology: hyper-accumulation metals in plants. *Water Air Soil Pollution* 184: 105-126. 2) Gan, S., Lau, E.V., Ng, H.K. 2009. Remediation of soils contaminated with polycyclic aromatic hydrocarbons (PAHs) *Journal of Hazardous Materials*, 172 (2-3): 532-549. 3) Serafim, L.S., Lemos, P.C., Albuquerque, M.G.E., Reis, M.A.M. 2008. Strategies for PHA production by mixed cultures and renewable waste materials. *Applied Microbiology and Biotechnology*, 81 (4): 615-628.

---

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 1.96



UNIVERSITY  
OF WARMIA AND MAZURY  
IN OLSZTYN

Student's independent work: 1.54