



MODULE SPECIFICATION

Module code	
Module title in Polish	Biologia i ekologia
Module title in English	Biology and Ecology
Module running from the academic year	2016/2017

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Environmental Engineering
Level of qualification	first cycle (first cycle, second cycle)
Programme type	academic (academic/practical)
Mode of study	full-time (full-time/part-time)
Specialism	-
Organisational unit responsible for module delivery	Department of Water and Wastewater Engineering
Module co-ordinator	Lidia Dąbek, PhD hab., Eng., Professor of the University
Approved by:	Lidia Dąbek, PhD hab., Eng., Professor of the University

B. MODULE OVERVIEW

Module type	core module (core/programme-specific/elective HES*)
Module status	compulsory module (compulsory/optional)
Language of module delivery	Polish/English
Semester in the programme of study in which the module is taught	semester 1
Semester in the academic year in which the module is taught	winter semester (winter semester/summer semester)
Pre-requisites	None (module code/module title, where appropriate)
Examination required	(Yes/No) Yes
ECTS credits	5

* elective HES – elective modules in the Humanities and Economic and Social Sciences



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Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	30E	-	30	-	-



C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to familiarise students with the following: biological process occurring in the environment; processes accompanying neutralizing pollutions and providing remediation of degraded areas; biological hazards of internal and external environment
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Module outcome code	Module learning outcomes	Mode of instruction (l/c/lab/p/ others)	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student has fundamental knowledge on the structure and physiology of cells and tissues and such taxonomic units as: viruses, bacteria, fungi, green algae, or other protists. In addition, a student knows the principles of growing and the methods of examining hygienic and sanitation condition of surface waters with various level of contamination (as well as sewage, soils, air, and sewage deposits). Furthermore, a student has knowledge on the scope of population ecology and biocenoses.	I	IŚ_W07	T1A_W01 T1A_W03 T1A_W08
W_02	A student is knowledgeable about basic biological processes taking place in the environment. Moreover, a student knows and understands the effects of the presence of microorganisms or pollutants on the environment (including anthropogenic pollutants).	I	IŚ_W07 IŚ_W16	T1A_W01 T1A_W03 T1A_W05 T1A_W07 T1A_W08
W_03	A student has systemised knowledge on biological processes of environment purification methods.	I	IŚ_W07 IŚ_W09	T1A_W01 T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07 T1A_W08
W_04	A student is familiar with legal, administrative, and technical aspects of protecting water, soil, and air.	II	IŚ_W09 IŚ_W11 IŚ_W18	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07 T1A_W08
U_01	A student is capable of obtaining information from databases, literature on the subject, and other sources. A student can also integrate the obtained information, interpret them, draw conclusion, and justify his/her opinions.	II	IŚ_U02	T1A_U01 T1A_U05 T1A_U07
U_02	A student can interpret and present cause-and-effect connections between the phenomena occurring in the environment and the activity of a man.	I	IŚ_U09	T1A_U01 T1A_U04 T1A_U10



U_03	A student can conduct research facilitating hygienic and sanitary assessment of water, soil, air, active deposition; a student can also correctly select the methods and devices.	I	IŚ_U03 IŚ_U08 IŚ_U12	T1A_U02 T1A_U08 T1A_U09 T1A_U15
U_04	A student applied OHS principles in the Biological and Microbiological Laboratory.	I	IŚ_U26	T1A_U11
U_05	A student can work individually and in a team; a student is also able to prepare and realise a schedule connected, e.g. with preparing microscope slides or hygienic and sanitary assessment of water (or sewage) samples with various degree of contamination.	I	IŚ_U03	T1A_U02 T1A_U08
K_01	A student can work individually and in a team. Moreover, a student is responsible for the reliability of the obtained results. A student can also interpret the obtained results and formulate results.	I	IŚ_K01 IŚ_K02 IŚ_K05 IŚ_K07	T1A_K02 T1A_K03 T1A_K04 T1A_K05 T1A_K07
K_02	A student is aware of the necessity of raising his/her professional and personal competences. A student independently improves and broadens his/her knowledge in this respect.	II	IŚ_K03 IŚ_K09	T1A_K01 T1A_K02 T1A_K04
K_03	A student understands the necessity of raising his/her social awareness on hygienic and sanitary quality of water, soil, and air.	II	IŚ_K06	T1A_K06; T1A_K07

Module content:

1. Topics to be covered in the lectures
2. Topics to be covered in the classes
3. Topics to be covered in the laboratories

No.	Topics to be covered in the lectures	Module outcome code
1.	Introduction to the subject. Cell structure of organisms. The characteristics of <i>Prokaryota</i> and <i>Eucaryota</i> . The structure and main functions of cell components. Cell multiplication. Main differences in prokaryotic and eukaryotic cell structure (the organisation and replication of the genetic material and cell organisation). The differences in the structure of plant and animal cell.	W_01 U_01 K_02
2.	Plant and animal cells.	W_01 U_01 K_02



3.	An outline of the systematicity of organisms. The structure of viruses and their role in biosphere. The taxonomy of viruses. The structure of bacteria and their role in biosphere. The classification of bacteria. The features utilised for the identification of bacteria. The structure of fungi and their role in biosphere. The taxonomy and structure of green algae and protists (and their role in biosphere).	W_01 U_01 K_02
4.	The methods organisms nutrition. Parasitological issues in environmental engineering (an overview of the selected parasites, parasitic diseases).	W_01 U_01 K_02
5.	Metabolism (katabolism and anabolism). Respiratory chain. The system of generating ATP (substrate, oxidation, and photooxidation phosphorylation).	W_01 U_01 K_02
6.	Photosynthesis as a fundamental anabolic process. Aerobic and anaerobic respiration, fermentation. Methane fermentation (its target, process phases, and the microorganisms of particular phases, their role and growth parameters).	W_01 U_01 K_02
7.	The role bioorganisms in the biogeochemical circulation of carbon, nitrogen, sulphur, and iron in the environment. The role of bacteria in technological processes. The role of microorganisms in destroying utility objects.	W01 U01 K02
8.	The fundamentals of ecology: <ul style="list-style-type: none"> • ecology in the system of biological sciences • ecological systems • first and second principles of ecological cars • the Earth as the environment of life • the classification of environment factors • water in the environment • water and energy management of organisms 	W_01 U_01 K_02
9.	Population ecology. Tolerance for environmental factors. The Liebief and Shelford law.	W_01 U_01 K_02
10.	The ecology of biocenoses.	W_01 U_01 K_02
11.	The ecology of inland waters. Self-purification of waters (the role of microorganisms in water purification). Water as a carrier of pathogenic microorganisms. The degradation of water bodies.	W_01 W_02 U_01 U_02 K_02
12.	Drinkable water: the microbiology of drinkable waters; sanitary requirements; the quality of drinkable water in terms of sanitary conditions. Waters contaminated with municipal and industrial sewage: the microbiology of urban and industrial sewage; the microbiology of deposits and active deposition.	W_01 W_04 U_01 U_02 K_02 K_03
13.	The organisation of forest biocenoses. The organisation of biocenoses as regards cultivated fields.	W_01 U_01 K_02 K_03
14.	Air as the factor conditioning the existence of organisms in the biosphere. Air microbiology. The sources and types of pollution. Assessment criteria as regards a sanitary condition of air.	W_01 W_02



		W_04 U_01 U_02 K_02 K_03
15.	Composting solid waste and sewage depositions. Water and soil as the place of organism existence as well as carrying pathogenic organisms.	W_02 U_01 U_02 K_02 K_03
16.	Anthropogenic disorders in ecosystems	W_02 U_01 U_02 K_02 K_03

No.	Topics to be covered in the laboratories	Module outcome code
1.	Discussing the essence of the subject, familiarising students with: OHS principles in the Biological and Microbiological Laboratory; basic equipment, apparatus, and glass applied for microbiological tests; microscoping technique.	W_03 U_01 U_04 K_01
2.	Bacteria morphology. The technology of preparing microscope preparations. The technology of setting microscope preparations under immersion. Microscope observation of various morphological types of bacteria in ready-made slides.	W_03 U_01 U_03 U_04 U_05 K_01 K_02
3.	The methods of preparing solidified preparations. The methods of dying bacteria (dying with methylene blue, the Gram method, dying spores, negative dying, negative and positive dying).	W_03 U_01 U_03 U_04 U_05 K_01 K_02
4.	Sterilisation and disinfection. Culture medium: the composition, types, preparation, and sterilisation.	W_03 U_01 U_03 U_04 U_05 K_01 K_02
5.	The population of bacteria: preparing the population of bacteria; determining toleration range of a bacteria population to the salinity degree; determining toleration degree of a bacteria population for oxygen contents.	W_03 U_01 U_03 U_04 U_05 K_01



		K_02
6.	Biological processes of decomposition as regards organic matter by water and soil organisms.	W_03 U_01 U_03 U_04 U_05 K_01 K_02 K_03
7.	Biological methods of controlling biocenosis state (the sorbic and biotic method, biodiversity): hydrobiological analysis of surface water with diverse degree of contamination; familiarising students with main indicating organisms from the group of benthonic macroinvertebrate and an attempt of independent identification; microbiological analysis of surface waters with various degree of contamination; determining the number of fungi in the examined sample.	W_03 U_01 U_03 U_04 U_05 K_01 K_02 K_03
8.	The principles of interpreting the results with respect to the binding regulation. Interpreting the obtained results concerning surface water.	W_04 U_01 U_04 U_05 K_01 K_02 K_03
9.	Hygienic and sanitary assessment of sewage, sewage depositions, soils, and air on the basis of biological analyses (hydrobiological, microbiological, and parasitological) in terms of the binding regulations.	W_03 W_04 U_01 U_04 U_05 K_01 K_02 K_03
10.	Biological purification of the environment. The ecology of anthropological environments. The biocenosis of the active deposition (macroscopic and microscopic analysis of the active deposition). The biocenosis of the biological membrane.	W_03 U_01 U_03 U_04 U_05 K_01 K_02 K_03
11.	Determining the most important physiological group of bacteria occurring in the active deposition as well as in the biological membrane.	W_03 U_01 U_03 U_04 U_05 K_01 K_02

Assessment methods

Module outcome code	Assessment methods <i>(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)</i>
W_01	An examination
W_02	An examination



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W_03	Obtaining a credit for laboratory classes (an entry test and a report)
W_04	An examination; obtaining a credit for laboratory classes (an entry test and a report)
U_01	An examination; obtaining a credit for laboratory classes (an entry test and a report)
U_02	An examination
U_03	Obtaining a credit for laboratory classes (an entry test and a report)
U_04	Obtaining a credit for laboratory classes (an entry test and a report)
U_05	Obtaining a credit for laboratory classes (an entry test and a report)
K_01	Obtaining a credit for laboratory classes (an entry test and a report)
K_02	An examination; obtaining a credit for laboratory classes (an entry test and a report)
K_03	An examination; obtaining a credit for laboratory classes (an entry test and a report)



D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	Study time/ credits
1	Contact hours: participation in lectures	30
2	Contact hours: participation in classes	-
3	Contact hours: participation in laboratories	30
4	Contact hours: attendance at office hours (2-3 appointments per semester)	3
5	Contact hours: participation in project-based classes	-
6	Contact hours: meetings with a project module leader	-
7	Contact hours: attendance at an examination	2
8		-
9	Number of contact hours	65 <i>(sum)</i>
10	Number of ECTS credits for contact hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	2.6
11	Private study hours: background reading for lectures	20
12	Private study hours: preparation for classes	-
13	Private study hours: preparation for tests	10
14	Private study hours: preparation for laboratories	20
15	Private study hours: writing reports	-
16	Private study hours: preparation for a final test in laboratories	-
17	Private study hours: preparation of a project/a design specification	-
18	Private study hours: preparation for an examination	10
19		-
20	Number of private study hours	60 <i>(sum)</i>
21	Number of ECTS credits for private study hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	2.4
22	Total study time	125
23	Total ECTS credits for the module <i>(1 ECTS credit = 25-30 hours of study time)</i>	5
24	Number of practice-based hours <i>Total practice-based hours</i>	50
25	Number of ECTS credits for practice-based hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	2.0

E. READING LIST

References	<i>Verma P. S. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology, Publisher: S Chand; Reprint Edn. 2006 edition (1 September 2004), p. 1296</i>
Module website	