

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Environmental Biology and ekology		Code 1010101221010130895
Field of study Environmental Engineering First-cycle Studies	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 2
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: 15 Project/seminars: -		No. of credits 3
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences Technical sciences natural sciences Biology		ECTS distribution (number and %) 1 34% 1 34% 2 66% 2 66%
Responsible for subject / lecturer: dr Michał Michalkiewicz email: Michal.Michalkiewicz@put.poznan.pl tel. 61 665 24 16 Faculty of Civil and Environmental Engineering ul. Piotrowo 5 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of the biology and ecology of the range of material from high school.
2	Skills	The ability to use literature and self-education, making observations, drawing conclusions, working in a group.
3	Social competencies	Is aware of the need to learn, able to work in a group.
Assumptions and objectives of the course: - familiarize students with the basic knowledge about the occurrence and use of micro-organisms in the environment; - familiarize students with the problems of ecology, environmental contamination and preventing degradation.		
Study outcomes and reference to the educational results for a field of study		
Knowledge: 1. The student knows the classification, systematic position, construction and characterization of prokaryotic and eukaryotic - [K_W01, K_W03, K_W04] 2. The student knows the indicator bacteria in the study of water, waste water and air disinfection methods of these environments - [K_W04, K_W05, K_W07] 3. The student knows the characteristics of surface and groundwater, and the risks arising from the presence of microorganisms in the water - [K_W05, K_W07, K_W09] 4. The student knows the effects of the impact of human activity on the environment and is able to counteract the negative role of different industries in the biosphere - [K_W02, K_W08]		
Skills:		

<ol style="list-style-type: none">1. The student is able to characterize and evaluate the positive and negative role of microorganisms in the surrounding medium - [K_U04]2. The student is able to formulate, identify and assess the degree of microbial contamination of water, air and soil - [K_U03, K_U10]3. The student is able to calculate and identify basic microorganisms present in water and air, and give an adequate assessment of the degree of contamination of the environment - [K_U05, K_U11]4. Student is able to determine, plan and carry out experimental studies and draw appropriate conclusions and predict and identify the effects of contamination of surface water and groundwater - [K_U08]5. The student is able to identify and interpret the causes, effects and ways to remedy the environmental degradation and perform observations, prepare written documentation and graphical - [K_U14, K_U01]
Social competencies:
<ol style="list-style-type: none">1. The student is aware of the desirability of the study and control of the natural environment - [K_K01]2. The student is aware of and ability to apply appropriate treatments aimed at reducing environmental contamination (microbiological and physico-chemical) - [K_K02]3. The student understands and is aware of the validity of the social effects of engineering on the environment - [K_K02]4. Student is able to rationally manage natural resources and knows the principles of sustainable development - [K_K04]

Assessment methods of study outcomes
<p>- Examination, tests, exercise reports</p> <p>During the exam is done written exam (effects: W1,W2,W3,W4,W5,W7,W8,W9). The condition of the exam is to have credit for laboratory exercises. On exercises to evaluate the knowledge and the student's work includes: written tests, oral answers, reports of the exercises (effects U1,U3,U4,U5,U8,U10,U11,U14, K1,K2,K4).</p> <p>Throughout the semester, students are consulted (1.5 h / wk.).</p> <p>Registration for the exam: within 2 weeks of the findings with students examination date, before the session is established, the term exam, the exam takes place during the exam, an exam takes place during the resit session. Exam in the session and an exam is in writing.</p> <p>Getting points for the exam (40 questions, max. 40 pts.). For each answer you get from 0 to 1 point.</p>

Course description
<p>Lectures: Place of microbiology in environmental engineering; organisms systematic basis; characteristics and structure of prokaryotic organisms; eukaryotic cell structure and physiology of organisms. The concept of metabolism (prokaryotes nutrition, respiration, reproduction, conjugation). Characteristics and physiology of bacteria; The impact of external factors on microorganisms. Breeding base of micro-organisms and their practical use. Microorganism culture medium; Sanitary bacteriological analysis of water. Indicator microorganisms in the study of water and the eligibility criteria for drinking water; Polish and international (WHO) rules on the quality of water (for drinking, bathing, swimming pools). Water and its purification. Groundwater (surface and underground). Drinking water disinfection methods. Micro-organisms present in the water bacteria iron, manganese and sulfur. Parasitic protists present in the water. Wodnopochoodne parasitic diseases. Characteristics of human parasites. Basics of Hydrobiology. General characteristics of the lakes; annual cycle of thermal and oxygen. Microbiology and air pollution: microbiological test methods for air pollution, disinfection and air purification, aerogenne disease.</p> <p>- Threads laboratory;</p> <ol style="list-style-type: none">1. Microscope, the principles of microscopy, cell morphology and bacterial colonies, coloring simple and complex, classification of microorganisms and their occurrence in the environment.2. The microbial culture media, sterilization and disinfection.3. Sanitary bacteriological analysis of water, test on fermentacyjno - the tube (FP), membrane filters (FM) and plate culture.4. Sanitary bacteriological analysis of water, reading and final judgment.5. Construction of a typical plant cell and microscopic analysis of seston.6. Bacteriological pollution of air. Test methods. Air pollution indicator organisms. Air disinfection.7. Evaluation of the sanitary condition of the tested air spaces.
Basic bibliography:
<ol style="list-style-type: none">1. Lampert W., Sommer U. Ekologia wód śródlądowych. Warszawa, PWB, 20012. Kunicki-Goldfinger W. Życie bakterii. Wydawnictwo Naukowe PWN, 20013. Nicklin J., Graeme-Cook K., Paget T., Killington R.A. Mikrobiologia ? krótkie wykłady. PWN, 2000.4. Michałkiewicz M., Fiszler M. Biologia sanitarna ? ćwiczenia laboratoryjne. Skrypt Politechniki Poznańskiej, 2007.

Additional bibliography:		
1. Libudzisz Z., Kowal K., Żakowska Z. Mikrobiologia techniczna. Tom 1 i 2. PWN Warszawa		
2. Mikrobiologia ogólna / Hans G. Schlegel ; tł. zbiorowe pod red. naukową Zdzisława Markiewicza ; [tł. z wyd. niem. Jadwiga Baj et al.].		
3. Michałkiewicz Michał. 2006. Mikroorganizmy w otoczeniu człowieka. Wodociągi - Kanalizacja 4(26), 25-28. ISSN 1731-724X		
4. Michałkiewicz Michał. 2006. Bakterie wskaźnikowe występujące w wodach. Wodociągi - Kanalizacja 5(27), 22-24. ISSN 1731-724X.		
5. Michałkiewicz Michał, Michałkiewicz Marek. 2003. Pasożyty człowieka w wodzie, ściekach i osadach. Gaz, Woda i Technika Sanitarna, Nr 6/2003, 205-210. p-ISSN: 0016-5352.		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	15	
2. Participation in the laboratory exercises	15	
3. Preparation for laboratory	10	
4. Preparation (at home) reports of laboratory	5	
5. Participation in the consultation	2	
6. Additional work of its own; eg. the library, etc	10	
7. Preparation for the exam	17	
8. Participation in the exam	1	
Student's workload		
Source of workload	hours	ECTS
Total workload	75	3
Contact hours	33	1
Practical activities	15	1