Course Syllabus

I. General Information

Course name in English	Bioanalytical methods for water monitoring in the EU legislation
Course name in Polish	Bioanalityczne metody monitoringu wód w ustawodawstwie UE
Programme	Bioanalytical technologies
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	MSc
Form of studies (full-time, part-time)	Full-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	dr Tomasz Lenard/ dr Michał Solis

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS
Lecture	15	III	6
Classes	30	III	
Field work	15	III	

Course pre-requisites	Basics of biology, biostatistic

II. Course Objectives

To acquire knowledge about the principles of water monitoring in the EU.
Getting acquainted with the analysing methods of particular groups of organisms recommended in monitoring of water in the UE.
To acquire basic abilities of taxonomical identification of particular groups of organisms recommended in monitoring of water in the UE.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	The student knows the specific terminology used in the EU water monitoring, understands and is able to define complex phenomena and processes occurring in living organisms	K_W01
W_02	The student knows analytical methods used in monitoring of water environment according to the EU legislation	K_W01, K_W02
W_03	The student has deepen knowledge in terms of statistics giving the possibility to explain and interpret natural phenomena especially relevant for water monitoring as well as has knowledge of specialist computer tools	K_W04
W_04	The student has knowledge of the principles of planning research using water monitoring research techniques and tools	K_W05

SKILLS		
U_01	The student applies advanced techniques and research tools in the life sciences, particularly in the monitoring of water environment	K_U01
U_02	The student is able to critically select the available information, including those from the electronic sources and based on them to formulate reasonable judgments	K_U03
U_03	The student can design and carry out the experiment or expertise under the guidance of tutor	K_U07
U_04	The student collects and interprets experimental data and on that basis formulates appropriate conclusions	K_U14
U_05	The student shows responsibility for the evaluation of threats arising from applied by himself research techniques and the creation of conditions for the safely work in the laboratory	K_U15
U_06	The student has deepened awareness of level of his knowledge and skills, understands the need for continuous personal and professional development and is open to modern technologies used in water monitoring and guides others in this regard	K_U17
U_07	When planning a scientific experiment he/she can properly determine the priorities for the implementation of the task, can interact and work in a team undertaking different roles in it	K_U18, K_U19
COMPETENCIES		
K_01	The student is aware of the meaning, value, and need to analyse the water environment	K_K01
K_02	The student is taking care on entrusted laboratory equipment, is able to gauge danger resulting from applied research methods	K_K03
K_03	The student correctly identifies and resolves dilemmas associated with the profession and is aware of the need for ethical conduct during planning and carrying out research experiments	K_K04
K_04	The student acts in accordance with the principles of occupational health and safety	K_K05

IV. Course Content

Lecture contents:
Water Framework Directive (WFD) - integrated river basin management for Europe.
Guideliness for water monitoring. Research methods in water monitoring.
Quality elements for the classification of ecological status of water.
Biological elements in water monitoring.
Hydromorphological, chemical and physico-chemical elements supporting the biological elements.
Interpretation of biological quality data according to WFD.
Examples of intercalibration of biological indexes in the EU countries.
Review of lectures and preparations for final exam.
Classes content:
Biological elements for water monitoring according to WFD:
Composition, abundance and biomass of phytoplankton and analysis of chlorophyll-*a* concentration;
Composition and abundance of other aquatic flora;
Composition and abundance of benthic invertebrate fauna;
Composition, abundance and age structure of fish fauna.

Methods of measurement of primary productivity and respiration in aquatic ecosystems. Field work content: Selection of representatives places for water monitoring according to WFD. Measurements of chemical and physico-chemical elements of water *in situ*. Collecting of biological samples from different types of water (lakes, rivers, reservoirs). Material taken during field studies will be analyzed in laboratory classes.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
KNOWLEDGE			
W_01 W_02 W_03 W_04	Conventional lecture, laboratory analysis,	Written exam/test	Evaluated test/exam, written work/protocol
SKILLS			
U_01 U_02 U_03 U_04 U_05 U_06 U_07	Laboratory classes, practical classes, observation and measurement in the field, group work, Socratic method	Written test, observation and report, test of practical skills	Evaluated test, report printout, rating card
COMPETENCIES			
K_01 K_02 K_03 K_04	Laboratory classes, group work, Socratic method	Written test, observation and report	Evaluated test, report printout

VI. Grading criteria, weighting factors

Written test to pass the lecture: 100%

Lab classes:
80% grades from written tests
10% reports
10% practical skills

Field work:
70% practical skills
30% reports

Mark	**Evaluation criteria**	
Very good (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 95-100%
overgood (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 85-94 %

Good (4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 75-84%
Quite good (3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 65-74%
sufficient (3)	the student accomplishes the assumed learning outcomes necessary as prerequisite	the student demonstrates knowledge of the education content at the level of 55-64%
insufficient (2)	the student accomplishes the assumed learning outcomes at an insufficient level	the student demonstrates knowledge of the education content below the level of 55%

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	70 (60 + 10 individual consultation)
Number of hours of individual student work	80

VIII. Literature

Basic literature
1. Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy 2. The EU Water Framework Directive - integrated river basin management for Europe https://ec.europa.eu/environment/water/water-framework/index_en.html 3. Martin O., 2017. Aquatic Ecology and Biodiversity. ML Books International 4. Hughes J.M.R., 2018. Freshwater Ecology and Conservation: Approaches and Techniques. Oxford University Press
Additional literature
1. Seuront L., Strutton P.G., 2003. Handbook of Scaling Methods in Aquatic Ecology: Measurement, Analysis, Simulation. CRC Press 2. Current scientific articles of the topic