*Załącznik nr 40 do uchwały Nr 46 Senatu UMK z dnia 24 czerwca 2025 r.*

**S t u d y p r o g r a m m e**

***Part A) of the study programme***

**L e a r n i n g o u t c o m e s**

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| **Faculty offering the field of study:** | **Faculty of Biological and Veterinary Sciences** |
| **Field of study:** | **Global Change Biology** |
| **Level of study:** | **Second-cycle studies** |
| **Level of the Polish Qualifications Framework:** | **Level 7** |
| **Degree profile:** | **Academically oriented** |
| **Professional degree awarded to the graduate:** | **magister** |
| **Allocation of the field of study within academic or artistic discipline(s), to which learning outcomes for a given field of study refer:** | **Discipline: biological sciences (100%)**<br><br>**Major discipline: biological sciences** |

| Symbol | Upon completion the graduate achieves the learning outcomes specified below: |
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| | **KNOWLEDGE (the graduate knows and understands)** |
| K_W01 | To provide in-depth and up-to-date knowledge of biophysics and biochemistry |
| K_W02 | To explain the biological concepts and relationships between natural phenomena and processes, as well as relationships between structure and function |
| K_W03 | To outline the appropriate physicochemical methods of organisms and biological processes |
| K_W04 | And provide an understanding of the complex phenomena involving organisms and their communities |
| K_W05 | To characterize the unity and diversity of the structure and functioning of organisms |
| K_W06 | To supply an understanding of the impact of organisms on their environment |
| K_W07 | To provide in-depth knowledge of the impact of the environment on human health |
| K_W08 | To supply an in-depth knowledge of statistics and specialized IT tools appropriate for describing and forecasting the course of natural phenomena |
| K_W09 | Together with the methodologies required for qualitative and quantitative investigation of the biological sciences |
| K_W10 | To develop a knowledge of the molecular biology of biological production |
| K_W11 | To supply up-to-date knowledge of biological research (biochemistry, genetics, microbiology and physiology). |
| K_W12 | To familiarize the student with specialized computer software packages (word processors, databases, spreadsheets, numerical libraries) |
| K_W13 | To supply an understanding of the basic concept and principles of copyright and patent law |
| K_W14 | And the rules of ethics |
| K_W15 | To outline current problems in the field of biology |
| K_W16 | To provide a thorough knowledge of the professional literature in the field including areas of specialization |
| K_W17 | And define the basic principles of occupational health and safety and ergonomics |
| K_W18 | To set out the principles for creating and developing a form of individual entrepreneurship based on biological knowledge. |
| | **SKILLS (the graduate is capable of)** |

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| K_U01 | A thorough knowledge of the use of statistics for describing biological phenomena |
| K_U02 | A knowledge of biochemistry, microbiology, molecular biology and physiology in the analysis of natural processes. |
| K_U03 | And facility with advanced measurement and analytical techniques used in biological research |
| K_U04 | Computer literacy necessary to retrieve information, communicate, organize and analyse data, prepare reports and present results |
| K_U05 | An ability to correctly assess threats to human health and life |
| K_U06 | A familiarity with qualitative and quantitative methods for assessing the state of a population of plant and animal species and biological material |
| K_U07 | An ability to develop scientific hypotheses based on logical reasoning |
| K_U08 | Based on measurements aimed at interpreting observations: production of results upon which to arrive at conclusions. |
| K_U09 | Using English source information, an ability to perform analyses, summarise and critically assess data, allowing formulation of correct conclusions |
| K_U10 | An ability to make observations and take measurements in the field and / or laboratory in the presence of a tutor |
| K_U11 | Demonstrate an ability to read and understand professional literature in the mother tongue and in English |
| K_U12 | Use of a foreign language enabling basic communication in the field of biological sciences in accordance with the requirements of B2 + CEFR |
| K_U13 | Application of the rules of ethics when working as a leader or as part of a team. |
| K_U14 | An ability to present the results orally in English, as well in the writing of scientific reports |
| K_U15 | Use of scientific language to a standard that enables the documentation and development of research results |
| K_U16 | Demonstrate an ability to choose a specialization and plan a professional career |
| **SOCIAL COMPETENCES (the graduate is willing to)** | |
| K_K01 | An understanding of the need to constantly expand knowledge with the use of scientific and popular science magazines |
| K_K02 | An ability to keep abreast of professional developments in the field of natural sciences together with an ability to inspire and organize the learning processes in others. |
| K_K03 | Develop a rational and critical approach to information obtained from scientific literature, the Internet, and other mass media, as well as popular beliefs relating to biological sciences. |
| K_K04 | Remain aware of the responsibility for the reliability of analyzes and expert opinions. |
| K_K05 | And aware of the need to follow the rules of ethics. |
| K_K06 | Keep a critical eye on working results. |
| K_K07 | Be eager to popularize biological knowledge |
| K_K08 | Remain aware of the need to use mathematical, statistical and IT methods to develop and present the results and analyses. |
| K_K09 | Be responsible for the safety of your own and others' work, with appropriate risk assessment and aware of the necessity for creating safe working conditions. |
| K_K10 | Be responsible for equipment used during research. |
| K_K11 | Capable of teamwork. |
| K_K12 | And aware of the importance of taking the initiative. |

**D e s c r i p t i o n o f t h e p r o c e s s r e s u l t i n g i n t h e a c h i e v e m e n t o f l e a r n i n g o u t c o m e s**

**Part *B) of the study programme***

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| **Faculty offering the field of study:** | Faculty of Biological and Veterinary Sciences |
| **Field of study:** | Global Change Biology |
| **Level of study:** | second cycle |
| **Level of the Polish Qualifications Framework:** | level 7 |
| **Degree profile:** | academically oriented |
| **Allocation of the field of study within academic or artistic discipline(s), to which learning outcomes for a given field of study refer:** | Discipline: biological sciences (100 %)<br><br>**Leading discipline**: biological sciences |
| **Mode of study:** | full-time programme |
| **Number of semesters:** | 4 |
| **Number of ECTS required for the award of qualifications corresponding to the level:** | 120 |
| **Total number of teaching hours:** | 1100 + general university classes |
| **Professional degree awarded to the graduate:** | magister (Master) |
| **The relationship between the study programme and NCU mission and strategy:** | The program of the Global Change Biology is in line with the main strategic goal of the Nicolaus Copernicus University, which is consolidating the position among the best focal points and teaching. The created course of study also has two operational goals - education of the educated strategic level: a) redistribution of studies from abroad and thus an appropriate level of the number of courses / development courses in foreign languages; b) courses of study offer in foreign languages. The program is structured to provide plug-in protection in education. Its aim is not only to transfer the latest knowledge, but also skills and development skills |

**Courses/course modules along with expected learning outcomes**

| Course module | Course | Expected learning outcomes | Forms and methods of teaching ensuring the achievement of learning outcomes | Methods of verifying and assessing expected learning outcomes achieved by the student |
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| **Ecology and Evolution** | Animal and Plant Ecophysiology | W1- Student has basic knowledge on biological concepts and complex natural phenomena and processes, as well as relationships and dependencies between structure and function.-K_W01, K_W02, K_W09<br>W2- Student understands which underlying factors determine rates of plant and animals growth and development.- K_W06<br>W3- Student is familiar with the physiological, morphological- and anatomical characteristics of plants and animals adapted to various habitats. - K_W03, K_W15<br>W4- Student is familiar with the phenomena occurring in organisms and their communities, the interactions of the environment and organisms living in it. K_W04, K_W11<br>W5- Student understands the impact of stress on plant growth and development and on crop production.-K_W16<br>W6- Student has knowledge on the current and future impact of global change and understands how this may affect plants and animals and the environments in which they live.- K_W04, K_W06 | Expository teaching methods:<br>- Laboratory: illustrative and research based on written instructions; students carry out tasks individually or in pairs; classes are conducted in a group of 8-12 students, because it is required by methodology of experiments: access to laboratory equipment and devices, and work with chemical reagents. | Laboratory – project in groups 61-68% satisfactory, 69-76% satisfactory plus, 77-84 % good, 85- 92% good plus, 93-100% very good W1, W2, U1, U2, K1 |

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| | | W5- student follows the safety and ergonomics rules - K_W17<br>U1- Student is familiar with a range of experimental approaches used to investigate the impact of changes in environment on the growth and physiology of plants and animals.- K_U08<br>U2 - Student is able to use knowledge of physiology, biochemistry and molecular biology in the analysis of natural processes.-K_U02<br>U3- Student has basic skills in advanced measurement and analytical techniques used in biological research.- K_U03<br>U4- Student can analyse measurements, interpret observations, and on their basis, develop and describe the results and draw correct conclusions.- K_U10<br>U5- Student can critically analyse and discuss scientific literature in the field of plant and animals physiological ecology. K_U11<br>K1- Student understands the need to constantly expand knowledge with the use of scientific and popular science magazines. K-K07 | | |

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| | | K2- Student is aware of the responsibility for the reliability of analyzes and expert opinions. - K_K01<br>K3- Student is responsible for the safety of his own and others' work, risk assessment and creating safe working conditions. - K_K09 | | |
| | Biostatistics | W1: defines a task or problem in the field of his specialty and selects appropriate statistical methods to solve them K_W08, K_W09<br>U1: applies advanced knowledge in the field of statistics to the biological data K_U01<br>U2: is able to use a foreign language to communicate at a basic level in accordance with the requirements of B2 ESOKJ K_U12<br>U3: has the ability to present results in English, as well as write a report in English K_U14<br>K1: demonstrates the ability to use statistical and multivariate methods to develop and present results and analyzes K_K08<br>K2: can work in a team, both by directing and coordinating the team's activities and by performing assigned tasks K_K11 | Expository teaching methods:<br>discussion, presentation, video / computer, pointer, banners image | Laboratory – project in groups 61-68% satisfactory, 69-76% satisfactory plus, 77-84 % good, 85- 92% good plus, 93-100% very good W1, W2, U1, U2, K1 |

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| | Multivariate analysis | W1: defines a task or problem in the field of his specialty and selects appropriate statistical methods to solve them K_W08, K_W09<br>U1: applies advanced knowledge in the field of statistics to the biological data K_U01<br>U2: is able to use a foreign language to communicate at a basic level in accordance with the requirements of B2 ESOKJ K_U12<br>U3: has the ability to present results in English, as well as write a report in English K_U14<br>K1: demonstrates the ability to use statistical and multivariate methods to develop and present results and analyzes K_K08<br>K2: can work in a team, both by directing and coordinating the team's activities and by performing assigned tasks K_K11 | Expository teaching methods:<br>discussion, presentation, video / computer, pointer, banners image | Laboratory – project in groups 61-68% satisfactory, 69-76% satisfactory plus, 77-84 % good, 85- 92% good plus, 93-100% very good W1, W2, U1, U2, K1 |
| | Ecology of Populations and Communities | W1: explains the interactions between organisms and environment- K_W06<br>W2: describes and explains mechanisms of biological invasions – K_W04<br>W3: describes the impact of biological invasions on the environment, economy and | Standard lecture, demonstration, preparing and conducting experiments, work with literature data | Lecture: Written exam – a test consisting of open and closed questions. Criteria for the final grade: 50-60% points - 3, 61-70% - 3+, 71-80% - 4, 81-90% - 4+, >90% - 5<br>Laboratory:<br>Written tests during laboratory classes |

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| | | human health – K_W06, K_W07<br>W4: knows the recent literature on biological invasions – K_W16<br>W5: defines the phenomenon of parasitism and explains parasitological terms - K_W02<br>W6: explains the interactions between parasites and environment - K_W07<br>U1: designs, conducts and interprets simple experiments under the teacher's supervision – K_U08, K_U09, K_U10<br>U2: reads scientific literature in the field of biological invasions – K_U11<br>U3: presents the results of conducted experiments and literature surveys – K_U14<br>U4: Correctly evaluates parasitic threats to human health and life - K_U05, K_U06<br>U5: Has oral presentation skills in English - K_U14, K_U12<br>K1: is critical with regard to the results of own work and data on biological invasions from scientific and popular sources – K_K03, K_K06<br>K2: is capable of team work during conducting experiments and preparing reports – K_K07, K_K11 | | Test of skills in identification of alien organisms<br>Evaluation of a report prepared on the basis of the conducted experiment<br>Evaluation of a short presentation in the field of biological invasions (mechanisms, important species, recent findings) on the basis of scientific literature provided by teachers<br>Activity during the classes<br>Final grade in laboratory classes will be an average of grades received in the above-mentioned categories |

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| | | K3: is responsible for work safety in a parasitological laboratory - K_K09<br>K4: shows criticism in relation to the results of his work - K_K07 | | |
| | Genetics and Evolution | Student<br>W1: explains biological concepts and complex of natural phenomena and processes K_W02<br>W2: has knowledge in the field of molecular biology in the environment K_W01, K_W10<br>W3: describes and explains factors affecting organisms spatial distribution - K_W02, K_W06<br>W4: knows molecular markers and describes molecular methods used in biogeography - K_W10, K_W11<br>W5: knows the recent literature on molecular biogeography – K_W16<br>Student<br>U1: is able to use source information in English, performs analysis, synthesis, summarizes and makes a critical assessment, which allows correct inference K_U09<br>U2: is able to use a foreign language to communicate at a basic level in accordance with | Expository teaching methods:<br>discussion, presentation, video / computer, pointer, banners image | Assessment methods:<br>Laboratory – presentation in groups, 61-68% satisfactory, 69-76% satisfactory plus, 77-84 % good, 85- 92% good plus, 93-100% very good W1, W2, U1, U2, U3, K1, K2 |

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| | | the requirements of B2 ESOKJ K_U12<br>U3: has the ability to present results in English, as well as write a report in English K_U14<br>Student<br>K1: understands the need to improve the knowledge with the use of scientific and popular journals K_K01<br>K2: rationally and critically approaches information obtained from scientific literature, the Internet, and other sources of mass media, as well as common beliefs relating to the topic K_K03 | | |
| | Dynamic biogeography | W1: describes and explains mechanisms of plant geography – K_W04<br>W2: describes the impact of plant and animal geography on the environment, economy and human health – K_W06, K_W07<br>W3: knows the recent literature on biogeography – K_W16<br>W4: knows the principles of phytogeography and zoogeography – K_W05<br>W5: knows the importance of distribution of animals for the function of ecosystems, human economy and health – K_W06 | Standard lecture, demonstration, preparing and conducting experiments, work with literature data | Lecture: Written exam – a test consisting of open and closed questions. Criteria for the final grade: 50-60% points - 3, 61-70% - 3+, 71-80% - 4, 81-90% - 4+, >90% - 5<br>Laboratory:<br>Written tests during laboratory classes<br>Test of skills in identification of plant species<br>Evaluation of a report prepared on the basis of the conducted experiment<br>Evaluation of a short presentation in the field of plant geography (mechanisms, important species, recent findings) on the basis of |

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| | | W6: Student explains the interactions between organisms and their environment (K_W07)<br>U1: designs, conducts and interprets simple experiments under the teacher's supervision –K_U04, K_U08, K_U10<br>U2: reads scientific literature in the field of biogeography – K_U11<br>U3: presents the results of conducted experiments and literature surveys –K_U09, K_U14<br>K1: is critical with regard to the results of own work and data on plant and animal geography from scientific and popular sources – K_K01, K_K03, K_K04<br>K2: is capable of team work during conducting experiments and preparing reports – K_K06, K_K11 | | scientific literature provided by teachers<br>Activity during the classes<br>Final grade in laboratory classes will be an average of grades received in the above-mentioned categories |
| | Applied Ecophysiology | W1: has knowledge of animal and physiological ecology- K_W03<br>W2: knows relationships between animals, plants and environment- K_W02, K_W06<br>W3: explains biological terms and relations between ecology and physiology- K_W15<br>W4: identifies basic analytical methods used in | Standard lecture, demonstration, preparing and conducting experiments, work with literature data | Assessment methods:<br>- test<br>Assessment criteria:<br>fail- 0-59 %)<br>satisfactory- 60-70%)<br>satisfactory plus- 71-80%<br>good – 81-87%<br>good plus- 88-94%<br>very good- >94%) |

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| | | physicochemical studies of organisms- K_W01, K_W11<br>W5: student follows the safety and ergonomics rules - K_W17<br>W6: Student can define a risk assessment during the fieldwork-K_W17<br>U1: applies basic natural-sciences knowledge to describe biological phenomena- K_U02<br>U2: uses basic tools and techniques used in biology- K_U03<br>U3: correctly formulates research hypotheses- K_U07<br>U4: uses sourses of scientific information- K_U09<br>K1: understands the need for continuous broadening of their knowledge- K_K01<br>K2: reasonably and critically deals with information obtained from the scientific literature, internet and other mass media, as well as from the common knowledge concerning biological sciences- K_K06, K_K03<br>K3: is aware of the need to adhere to ethical standards- K_K05 | | |
| **Bioconservation** | Ecosystem Functioning | W1: Explains biological concepts and complex natural phenomena and processes, as well as relationships and | 1. lecture with multimedia presentation<br>2. laboratory work | Lecture – W01, W02, U01 - a test consisting of open and closed questions. Criteria for the final grade: 50-60% points - 3, 61-70% - |

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| | | dependencies between structure and function - K_W02<br>W2: Explains the interaction of the environment and organisms living in it - K_W07 U1: Performs measurements, interprets observations, and on their basis, develops and describes the results and draws correct conclusions. -K_U08<br>U2: Designs and carries out observations and measurements in the field and / or laboratory in the presence of a tutor - K_U10<br>U3: Uses a foreign language enabling communication at a basic level in the field of biological sciences in accordance with the requirements of B2 + CEFR - K_U12<br>K1: Understands the need to increase professional competences in the field of natural sciences and is able to inspire and organize the learning process of other people - K_K02<br>K2: Has a rational and critical approach to information obtained from scientific literature, the Internet, and other mass media, as well as popular beliefs relating to biological sciences. - K_K03 K3: Is responsible for entrusted | | 3+, 71-80% - 4, 81-90% - 4+, >90% - 5<br>Laboratory classes –U02 - project in groups and test consisting of open and closed questions. Criteria for the final grade: 61-68% satisfactory, 69-76% satisfactory plus, 77-84 % good, 85- 92% good plus, 93-100% very good. |

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| | | equipment, own work and others. - K_K10<br>K4: Is capable of teamwork. - K_K11 | | |
| | Advanced techniques in environmental data analysis | W1: defines a task or problem in the field of his specialty and selects appropriate statistical methods to solve them K_W08, K_W09<br>W2: Has basic knowledge of the nature of climate changes in the Earth's history, with particular focus on the last thousand years – K_W02<br>W3: Knows the potential factors (both natural and anthropogenic) determining present and future climate and climate changes – K_W02<br>W4: Is able to assess the direction and rate of climate variations on various time and spatial scales – K_W02, K_W06, K_W07<br>W5: Has the essential knowledge to assess the probable consequences of climate changes on the natural environment and the economy – K_W02, K_W06, K_W07<br>U1: applies advanced knowledge in the field of statistics to the biological data K_U01<br>U2: is able to use a foreign language to communicate at a | Lecture and problem-based lesson with multimedia presentations<br>Laboratory exercises: experiments, climatological analyses based on collections of meteorological data, maps and atlases. | 1. Written examination in the form of test.<br>Mark range:<br>Percent of correct answers: Mark<br>0-50% fail (2,0)<br>51-60% pass (3,0)<br>61-70% pass plus (3,5)<br>71-80% good (4,0)<br>81-90% good plus (4,5)<br>91-100% very good (5,0)<br><br>2. Laboratory classes: marks from classes in the form of reports, marks given based on activity of students during classes; final mark is calculated as mean from all marks in the following way: 2,51-3,39 – pass, 3,40-3,74 – pass plus, 3,75-4,19 – good, 4,20-4,50 – good plus, above 4,50 – very good |

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| | | basic level in accordance with the requirements of B2 ESOKJ K_U12<br>U3: has the ability to present results in English, as well as write a report in English K_U14<br>U4: Is able to use and expand their knowledge in order to apply it to analysis of environmental processes – K_U04, K_U05, K_U07, K_U08<br>U5: Is able to practically define the interdependencies between climate changes and the natural environment – K_U04, K_U09,<br>U6: Is able to seek out, comprehend, analyse and exploit required information from the basic sources related to climate changes and its causes – K_U09, K_U11, K_U15<br>U7: Uses knowledge acquired relating to climate change and its causes in analyses of its influence on the natural environment and man – K_U09, K_U11, K_U15<br>K1: demonstrates the ability to use statistical and multivariate methods to develop and present results and analyzes K_K08<br>K2: can work in a team, both by directing and co-ordinating the team's activities and by | | |

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| | | performing assigned tasks K_K11<br>K1: Understands the need to maintain up-to-date knowledge on climate change and its causes – K_K01, K_K02, K_K03<br>K3: Is able independently or as part of a team to reliably and fairly assess the consequences of climate changes on the natural environment and man, and provide rational solutions – K_K02, K_K03, K_K04, K_K05<br>K4: Is able to appropriately define priorities in the realisation of tasks set by self or others – K_K01, K_K04, K_K05, K_K08, K_K11 | | |
| | Environmental impacts of genetically modified organisms | W1: Student uses the specific terminology and defines: transgenic organisms, GMM, GMO, LMO, promoter, exon, intron, terminator, mutant, cloning, genetic engineering - K_W02 K_W10, K_W11<br>W2: Student lists the stages of creating transgenic plants and plant selection genes - K_W02, K_W10, K_W11<br>W3: Student combines the structure of a genetic construct introduced into plants with its functionality - K_W02, K_W04<br>W4: Student has knowledge in the field of selection and | Lecture: informative lecture with multimedia presentations | Lecture:<br>Test written exam consisting of single-choice questions offering 4 eventualities. Each correct answer - 1 points. At least 20 questions in the test. Passing the exam after reaching at least 50% of the points available. Very good mark for more than 90% of the points. Other grades proportionally in the 50-90% range.<br>Written exam - W01, W02, W03, W04, W05, U01, U02, U03 |

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| | | targeted modification of plants in order to obtain new features useful for humans and the environment K_W10, K_W11,<br>W5: Student indicates the benefits and risks of using biotechnology in relation to man and the environment K_W06, K_W07,<br>W6: Student independently assesses the threats to health and human life currently discussed in specialist literature regarding GMM or GMO - K_W06, K_W07, K_W16,<br>U1: Student uses specialist terminology and biological nomenclature and specialized terms in genetics, biochemistry, biotechnology K_U02<br>U2: Student plans, illustrates and modifies the structure of the introduced construct to the GM plant - K_U02<br>U3: The student correctly evaluates threats to human health and life about GMM and GMO - K_U05<br>K1: Student follows the rules of ethics - K_K05<br>K2: Student rationally and critically approaches information obtained from scientific literature, the Internet, and other sources of mass | | |

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| | | communication regarding GMM or GMO - K_K02, K_K03<br>K3: The student is eager to popularize biological knowledge about GMM and GMO K_K07 | | |
| | Applied ecosystem services | W1: Students can analyze natural resource and environmental management problems by using appropriate methods from natural science disciplines K_W02<br>W2: Students demonstrate knowledge of ecological principles, and interdisciplinary aspects of natural resource and environmental management issues K_W02,<br>W3: Students are able to characterize the organization and functioning of ecological systems and the relationship between the organism and the environment K_W05<br>W5: objaśnia rolę i znaczenie środowiska przyrodniczego dla funkcjonowania człowieka; K_W13<br>W6: Students describes changes and environmental hazards caused by human activity on the surface of the earth, in soils and waters; K_W07<br>W7: Students lists and describes the basic methods, technologies, tools that allow to use the natural potential to improve the | Laboratory: group work - students carry out projects in groups of 2-3 persons and presentation, discussion and case study analysis, two essays<br>Lecture: informative lecture, discussion | Assessment methods:<br>- written project with oral presentation<br>- written examination<br>- test<br>- activity<br>Assessment criteria for lecture:<br>- activity,<br>- the presence of the lecture<br>- written exam<br>Assessment criteria for tutorial:<br>- activity,<br>- the presence of the tutorial<br>- positive test passed<br>- positive written project passed<br>- well received presentation of the project<br>- two essays<br>Assessment a percentage for test:<br>fail - below 55%<br>satisfactory - 56-64 %<br>satisfactory plus - 65-74 %<br>good – 75-84 %<br>good plus - 85-94 %<br>very good - 95-100 % |

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| | | quality of human life, as well as allow for the restoration of lost natural values; (K_W08)<br>U1: Students communicate effectively, both orally and in writing, to diverse audiences including professionals, resource managers, local communities and policy makers; (K_U14, K_U15)<br>U2: Students can conduct original, independent scientific research of professional quality in their specialization area; (K_U16)<br>U3: Students can function as professionals in their specialization area by demonstrating responsible and ethical conduct, effective collaboration, informed decision making, and life-long learning; K_U13, K_U16)<br>U4: Students uses a computer to search for information, create databases, analyze data, prepare reports and present results; (K_U04)<br>U4: Students recognize the health and environmental hazards and put the correct hypotheses about their causes; (K_U05, K_U07)<br>U5: Students interpret observations and measurements | | |

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| | | and draw correct conclusions on their basis; (K_U09)<br>U7: Students use source information in Polish and English, carry out analyzes, syntheses, summaries, critical assessments and correct conclusions; (K_U09)<br>K1: Students can function as professionals in their specialization area by demonstrating responsible and ethical conduct, effective collaboration, informed decision making, and life-long learning; (K_K01, K_K02)<br>K2: Students can constructively critique real or possible programs, policies, and institutions that impact ES, based on those possible impacts and the concepts of efficiency, equity, and sustainability; (K_K01; K_K03, K_K05)<br>K3: Students can advocate and support their views on the pros and cons of economic valuation of ecosystem services and other routes to affecting decision-making based on ecosystem services research and stakeholder input; (K_K01; K_K03, K_K07)<br>K4: Students are willing to work in a team as a member; (K_K11) | | |

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| | The future of land use | W1: Students can analyze natural resource and environmental management problems by using appropriate methods from natural science disciplines K_W02<br>W2: Students demonstrate knowledge of land use planning objectives and interdisciplinary aspects of natural resource and environmental management issues K_W02,<br>W3: Students are able to characterize the organization and functioning of ecological systems and the relationship between the organism and the environment (K_W05)<br>W4: Students lists and describes the basic methods, technologies, tools that allow to use the natural potential to improve the quality of human life (K_W08)<br>U1: Students communicate effectively, both orally and in writing, to diverse audiences including professionals, resource managers, local communities and policy makers; (K_U14, K_U15)<br>U2: Students can conduct original, independent scientific research of professional quality in their specialization area; (K_U16) | Laboratory: group work - students carry out projects in groups of 2-3 persons and presentation, discussion and case study analysis, two essays<br>Lecture: informative lecture, discussion | Assessment methods:<br>- written project with oral presentation<br>- written examination<br>- test<br>- activity<br>Assessment criteria for lecture:<br>- activity,<br>- the presence of the lecture<br>- written exam<br>Assessment criteria for tutorial:<br>- activity,<br>- the presence of the tutorial<br>- positive test passed<br>- positive written project passed<br>- well received presentation of the project<br>- two essays<br>Assessment a percentage for test:<br>fail - below 55%<br>satisfactory - 56-64 %<br>satisfactory plus - 65-74 %<br>good – 75-84 %<br>good plus - 85-94 %<br>very good - 95-100 % |

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| | | U3: Students can function as professionals in their specialization area by demonstrating responsible and ethical conduct, effective collaboration, informed decision making, and life-long learning; K_U13, K_U16)<br>U4: Students uses a computer to search for information, create databases, analyze data, prepare reports and present results; (K_U04)<br>U5: Students interpret observations and measurements and draw correct conclusions on their basis; (K_U09)<br>U6: Students use source information in Polish and English, carry out analyzes, syntheses, summaries, critical assessments and correct conclusions; (K_U09)<br>K1: In the concept of the spatial development plan students can refer the examples of foreign solutions described in the scientific literature of Elsevier journals and reports on the implementation of the projects available on the web (K_K01, K_K02, K_K03)<br>K2: Students can constructively critique and discuss real or possible programs, policies and the concept of the project, | | |

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| | | arguing for and against; (K_K01; K_K03)<br>K3: Students can advocate and support their views on the pros and cons of economic valuation of ecosystem services and other routes to affecting decision-making based on ecosystem services research and stakeholder input; (K_K01; K_K03, K_K04, K_K07)<br>K4: Students are aware of the work in a group, taking a leadership role and responsibility for the implementation new tasks; (K_K11, K_K12) | | |
| | The last of the wild: European protected areas | W1: knows the distribution of important habitats across Europe – K_W02<br>W2: knows the principles of creation national parks and nature reserves – K_W15<br>W3: knows the reasons for the threat of nature – K_W02, K_W14<br>W4: knows the principles of nature conservation – K_W05<br>U1: knows how to define the value of habitat – K_U06<br>U2: knows how to fill out the Natura 2000 standard data forms – K_U08, K_U13<br>U3: knows how to use and interpret various literature and data base sources – K_U11 | Information lecture, problem lecture<br>Team projects in laboratory classes based on field and literature data | Lecture<br>Written exam – a form consisting of descriptive and problematic questions covering the whole scope of knowledge delivered on lectures and obtained during self-study. Criteria for the final grade (points related to % of correct answers): 51-60% - 3 points, 61-70% - 3+ points, 71-80% - 4 points, 81-90% - 4+ points, >90% - 5 points<br>Laboratory classes<br>Written test – descriptive and multiple-choice test checking the knowledge obtained during laboratory classes.<br>Presentation of results of team-project activity |

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| | | K1: is capable of team work during gathering data and preparing reports – K_K04<br>K2: is capable to estimate negative impact of human activity on the environment and suggest the proper methods of counteraction – K_K05<br>K3: is capable to present the ideas of nature conservation for a wider audience – K_K07 | | Multimedial presentation of one of topics based on recent literature<br>Overall activity during classes<br>The final grade will be based on all listed activities (from 3 to 5) |
| | Applied statistics and spatial analysis in GIS | W1: Demonstrates an increased knowledge in the field of numeric maps analysis and geospatial data statistics as well as knowledge of specialized IT tools that enable describing and forecasting the course of natural phenomena – K_W08, K_W12<br>U1: Applies an advanced knowledge in the field of GIS analysis and statistics in the analysis of biological data of spatial nature – K_U01<br>U2: Makes use of a computer to find information, arrange data, develop reports and presentations of results obtained based on the numeric maps analysis – K_U04<br>U3: Puts correct scientific hypotheses based on logical reasoning – K_U07<br>K1: Demonstrates the ability to use mathematical, statistical and IT methods for the development | Seeker teaching methods: practical classes; project method. | Assessment methods:<br>- test<br>Assessment criteria: number of points obtained on final test<br>fail- 0-55 pts (0-55 %)<br>satisfactory- 55-64 pts (55-64%)<br>satisfactory plus- 65-74 pts (65-74%)<br>good - 75-84 pts (75-84%)<br>good plus- 85-94 pts (85-94%)<br>very good- 95-100 pts (95-100%) |

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| | | and presentation of results and analyses – K_K08<br>K2: Is responsible for the entrusted equipment, own work and activities of others – K_K10 | | |
| | Case studies in global change | W1: describes and explains environmental effects of global changes – K_W04, K_W06<br>W2: knows the recent literature on selected biological topics – K_W16<br>U2: reads scientific literature concerning global changes in the environment – K_U11<br>U3: presents the results of conducted literature surveys – K_U14<br>K1: is critical with regard to the results of own work and data on global change in the environment from scientific and popular sources – K_K03, K_K06 | Discussion, literature surveys, student presentations | Evaluation of a presentation on the selected topic<br>Activity during the classes (participation in discussion after presentations)<br>Final grade in laboratory classes will be an average of grades received in the above-mentioned categories |
| **Social and legal affairs** | European legal regulations in environmental protection | W1: Has in-depth knowledge of the influence of the environment on human health - K_W07<br>W2: Demonstrates knowledge of current problems in the field of biology - K_W15<br>U1: Puts correct scientific hypotheses based on logical reasoning - K_U07<br>U2: Uses source information in Polish and English, performs analysis, synthesis, summarizes and makes a critical assessment, | LECTURE:<br>a) teaching methods specifying:<br>- informative lecture (conventional)<br>- problem lecture<br>b) didactic methods looking for:<br>- classic problem method<br><br>EXERCISES: Didactic searching methods:<br>- classic problem method | LECTURE Assessment criteria (written test) - W1, W2<br>EXERCISES Colloquium - W1, W2, U1, U2 Paper - W1, W2, U1, U2 Activity - K1, K2 LECTURE Written exam: written test consisting of 25 questions (closed questions - single choice; 1 question - 1 point): nst - 12 points (48%) dst - 13-18 pts (52-72%) dst plus - 19 points (76%) db - 20-21 (80-84%) db plus - 22 points (88%) very good - 23-25 points (93- |

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| | | which enables correct conclusions - K_U09<br>K1: Understands the need to constantly expand knowledge with the use of scientific and popular science magazines - K_K01<br>K2: Has a rational and critical approach to information obtained from scientific literature, the Internet and other mass media sources, as well as to popular beliefs relating to biological sciences - K_K03 | - a paper<br>- case study | 100%) EXERCISES Colloquium: written test consisting of 15 questions (closed-single-choice questions; 1 question - 1 point): nst - 7 points (46%) dst - 8-9 pts (53-60%) dst plus - 10 points (66%) db - 11-12 (73-80%) db plus - 13 points (86%) very good - 14-15 points (93-100%) Paper - standard grading scale (evaluation criterion - way of completing the topic) Activity - Three pluses equal to 0.5 ratings on the regular rating scale |
| | Socioeconomic aspects of global change | W1: discuss possible ways of ensuring sustainable futures in the face of global environmental change (K_W16)<br>W2: explore emerging environmental governance issues and legislative frameworks (K_W13)<br>W3: introduce concepts and terms used in socio-economic analysis of environmental issues as well as methods of data collection, analysis and use of information (K_W15)<br>Students should be able to:<br>W4: understand the economic, socio-cultural, and political incentives and impediments to rainforest conservation; (K_W02) | Expository teaching methods:<br>informative lecture, discussion, presentation, video / computer, pointer, banners image | Assessment methods:<br>Lecture – final test, 61-68% satisfactory, 69-76% satisfactory plus, 77-84 % good, 85- 92% good plus, 93-100% very good W1, W2, U1, U2, U3, K1, K2<br>Laboratory – project in groups, 61-68% satisfactory, 69-76% satisfactory plus, 77-84 % good, 85- 92% good plus, 93-100% very good W1, W2, U1, U2, U3, K1, K2 |

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| | | W5: students understand the interactions between human and ecological systems; (K_W04)<br>W6: students appreciate the dilemmas in choosing between economic development and the environment;( K_W02, K_W04, K_W05)<br>W7: students describe changes and environmental hazards caused by human activity on the surface of the earth, in soils and waters;( K_W07)<br>W8: students know professional Polish and foreign language literature in the field of selected specialization (K_W16)<br>W9: students know the rules of ethics; (K_W14)<br>W10: explains biological concepts and complex of natural phenomena and processes under global urbanisation K_W02<br>W11: demonstrates knowledge of current issues in the field of global change and natural resources K_W15<br>U1: better understand the array of socio-cultural, economic and political factors that shape resource use; (K_U14, K_U15)<br>U2: conduct original, independent scientific research of professional quality in their specialization area; (K_U16) | | |

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| | | U3: use source information in Polish and English, carry out analyzes, syntheses, summaries, critical assessments and correct conclusions; (K_U09)<br>U4: recognize the health and environmental hazards and put the correct hypotheses about their causes; (K_U05, K_U07)<br>U5: demonstrate the information literacy skills of collecting, analysing and reporting data; (K_U09)<br>U6: is able to use source information in Polish and English, performs analysis, synthesis, summarizes and makes a critical assessment, which allows correct inference K_U09<br>U7: is able to use a foreign language to communicate at a basic level in accordance with the requirements of B2 ESOKJ K_U12<br>U8: has the ability to present results in English, as well as write a report in English K_U14<br>K1: Students demonstrate the desire to deepen knowledge in the field of socio-economic sciences; (K_K01)<br>K2: Students show caution and criticism in receiving information from the scientific literature, the Internet, and | | |

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| | | especially accessible in mass media, referring to social issues (K_K03)<br>K3: Students can cooperate with a good communication and work with other students; (K_K11)<br>K4: Students are willing to work in a team as a member; (K_K11)<br>K5: Students show criticism in relation to the results of his work; (K_K06)<br>K6: understands the need to improve the knowledge with the use of scientific and popular journals K_K01<br>K7: rationally and critically approaches information obtained from scientific literature, the Internet, and other sources of mass media, as well as common beliefs relating to the topic K_K03 | | |
| **Elective course module, e.g., university-wide courses or courses included in another field of study that are unrelated to a specific field of study** | Thesis Lab | W1: has knowledge of how to prepare presentations, reports, studies and manuscripts and mathematical knowledge in the field of data processing and analysis K_W08, K_W12,<br>W2: has in-depth knowledge in main disciplines enabling research and practical activities in the field of biology K_W01, K_W02, K_W03, K_W04, K_W05, K_W06, K_W07, K_W11, K_W15, | Laboratory work: project planning, experimental phase, data analysis, literature review, discussion.<br>Working out the theoretical background, literature search, thesis layout, data analysis, final writing. | Continuous marking according to the criteria established by the thesis promotor |

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| | | W3: identifies sources of scientific information on current trends in the discipline development, planning experiments, analyzes and interprets the obtained results K_W09, K_W11, K_W12, K_W15,<br>W4: speaks English to the extent necessary to read the current specialist literature in the field of study K_W15, K_W16<br>W5: characterizes the research methodology of the practiced discipline and detailed research techniques of the practiced specialization - K_W03, K_W13, K_W14<br>W6- student knows the safety and ergonomics rules - K_W17<br>W7- Student defines a risk assessment during the fieldwork-K_W17<br>W8- Student knows the possibilities of applying the acquired knowledge in the professional practice K_W18<br>U1: can prepare and present lectures, reports, documentation of experiments/analyzes, and expert opinions using correct scientific and technical terminology. K_U01, K_U04, K_U07, K_U08<br>U2: uses knowledge from field disciplines enabling research | | |

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| | | and practical activities in the field of biology K_U01, K_U02, K_U03, K_U06, K_U07,<br>U3: acquires, interprets and critically evaluates information from scientific sources relating to the discipline studied K_U04, K_U09, K_U11,<br>U4: speaks English on B2 ESOKJ level K_U12, K_U14,<br>U5: uses knowledge from various fields of science when planning research in biology - K_U01,<br>U6: writes scientific articles in English - K_U12, K_U15, K_U16<br>K1: is aware the importance of the ethics principle in the activity of molecular diagnostics, both in scientific and professional work K_K05, K_K04,<br>K2: is aware the limitations, but also the ever-widening knowledge and development of technology; understands the need for lifelong learning K_K01, K_K02,<br>K3: is aware the social problems and dangers associated with the development of molecular biology, in particular the development and use of genetically modified organisms; can explain the true meaning of | | |

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| | | these threats based on rational arguments but in a way that is understandable to the general public K_K03, K_K04, K_K05,<br>K4: critically analyzes the results of own research and research of other authors and is aware the need to undertake activities that increase the value of research and increase the effectiveness of work K_K03, K_K07<br>K5: acts in accordance with the code of ethical principles of scientific work and good manners - K_K06, K_K09<br>K6: respects the principles of public ownership of scientific research results, taking into account the principles of intellectual property protection - K_K07 | | |
| **Diploma project and diploma examination **** | Thesis of Specialization | W1: The graduate describes the rules of preparing and writing research papers- K_W13, K_W14, K_W16<br>W2: The graduate enumerates and discusses most important specialist literature in the field that is the focus of the Master's thesis-K_W15<br>W3: student knows the safety and ergonomics rules - K_W17<br>W4: Student can define a risk assessment during the fieldwork-K_W17 | Laboratory work: project planning, experimental phase, data analysis, literature review, discussion.<br>Working out the theoretical background, literature search, thesis layout, data analysis, final writing. | Assessment of the thesis |

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| | | W5: Student knows the possibilities of applying the acquired knowledge in the professional practice K_W18<br>U1: The graduate prepares research papers in and short scientific reports following general standards of writing research papers- K_U03, K_U10, K_U15<br>U2: The graduate is able to use specialist terminology in the field of environment protection in English- K_U12<br>U3: The graduate combines information from various sources in order to verify the existing opinions and hypotheses- K_U08<br>K1: The graduate is able to adequately specify his/her priorities in order to accomplish a task set by himself/herself or by other persons- K_K01, K_K02, K_K06, K_K09. K_K10, K_K11, K_K12 | | |

**Detailed allocation of ECTS credits**

**Academic or artistic disciplines, to which learning outcomes refer:**

| | **Academic discipline** | **ECTS credits** | |
|---|---|---|---|
| | | **number** | **%** |
| **1.** | **Biological sciences** | **120** | **100%** |

| Course modules | Course | No of ECTS credits | No of ECTS credits in the discipline: *(enter names of disciplines)* | No of ECTS credits for elective courses | No of ECTS credits obtained by the student in classes within contact hours with the teacher or tutor | No of ECTS credits obtained by the student as a result of: courses related to academic activity within a discipline or disciplines, to which the field of study is assigned/ courses focused on training practical skills |
|---|---|---|---|---|---|---|
| **Ecology and Evolution** | Animal and Plant Ecophysiology | **5** | **5** | | **2.1** | **5** |
| | Biostatistics | **5** | **5** | | **2.1** | **5** |
| | Multivariate analysis | **5** | **5** | | **2.1** | **5** |
| | Ecology of Populations and Communities | **5** | **5** | | **2.1** | **5** |
| | Genetics and Evolution | **5** | **5** | | **2.1** | **5** |
| | Dynamic biogeography | **9** | **9** | | **4.3** | **9** |
| | Applied Ecophysiology | **4** | **4** | | **1.8** | **4** |
| **Bioconservation** | Ecosystem Functioning | **5** | **5** | | **2.1** | **5** |

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| | Advanced techniques in environmental data analysis | **5** | **5** | | **2.1** | **5** |
| | Environmental impacts of genetically modified organisms | **2** | **2** | | **1.1** | **2** |
| | Applied ecosystem services | **5** | **5** | | **2.1** | **5** |
| | The future of land use | **4** | **4** | | **1.8** | **4** |
| | The last of the wild: European protected areas | **4** | **4** | | **1.8** | **4** |
| | Applied statistics and spatial analysis in GIS | **3** | **3** | | **1.5** | **3** |
| | Case studies in global change | **4** | **4** | | **1.8** | **4** |
| **Social and legal affairs** | European legal regulations in environmental protection | **3** | **3** | | **1.5** | |
| | Socioeconomic aspects of global change | **3** | **3** | | **1.5** | |
| **Diploma project and diploma examination** | Thesis Lab | **14** | **14** | **14** | **9.5** | **14** |
| | Thesis of Specialization | **30** | **30** | **30** | **16.7** | **30** |
| | **IN TOTAL:** | **120 ECTS** | **120/100%** | **44/36.7%** | **60.1/50.1%** | **114/95%** |

| Course modules | Course | Programme content |
|---|---|---|
| **Ecology and Evolution** | Animal and Plant Ecophysiology | - A short historical outline of the development of this field of research<br>- Tasks of plant and animal ecophysiology and basic research methods.<br>- Basic concepts and definitions, classification of environmental factors, typical reactions of organisms to environmental conditions.<br>- Ecophysiological significance of environmental abiotic and biotic factors<br>- Environmental determinants of life processes<br>- Interaction of environmental factors: stress and immunity, the cycle of matter, soil and water as living spaces.<br>- practical use of knowledge |
| | Biostatistics | To acquaint students with basic statistical methods, research planning, simple statistical tests. |
| | Multivariate analysis | Introduction to advanced methods and applications of environmental data analysis and research planning |
| | Ecology of Populations and Communities | The lecture deals with basic models in population ecology, insect pest gradations, principles in human demography, harvesting, life history tables, survival tables and temporal and spatial variability in population size.<br>The laboratory classes will cover basic methods of estimating population size and variability, examples of insect pests and their life history, effects of human impact on animal and plant populations and communities (including the ecology and evolution of synanthropic organisms), animal communication and predator prey interactions. |
| | Genetics and Evolution | Lecture:<br>Historical and philosophical foundation of modern evolutionary theory<br>Basics in phylogenetic systematics<br>Basics in palaeontology, history of life on earth, patterns of anagensis and cladogenesis<br>Basics in molecular evolution<br>Population genetics and pattern and processes of selection and adaptation<br>Mechanisms of speciation<br>Rise of biological complexity<br>Evolution of Man<br>Laboratory classes: |

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| | | The laboratory classes of Genetics and Evolution aim to present knowledge in general genetics and the basics of molecular biology. The classes provide students with knowledge about basic genetic concepts, mechanisms of inheritance, DNA replication, mutations, and DNA repair. Students acquire skills in performing the transformation of bacteria, the Ames test, culturing Drosophila melanogaster, and concluding heredity patterns from data obtained. The knowledge and skills obtained during the laboratory classes allow students to link DNA/genes and evolution. |
| | Dynamic biogeography | Students will learn about factors shaping distribution of animals and plants on the global and local scale, with special emphasis focused on anthropogenic changes affecting the occurrence, migrations and extinctions of organisms, including biological invasions. The lecture will also cover meteorology, climatology and their relationship with the ecosphere. During the practical part, students will learn how to estimate and observe changes in biodiversity using case studies of terrestrial plants and freshwater invertebrates. Classes will include fieldwork and laboratory classes Students willl learn to use global datasets, databases on biodiversity and current methods of analyzing and processing data on species distribution, including geographic spatial information systems (GIS). During the seminar part of the course, students will discuss results obtained in the field as well as major current controversies and hypotheses concerning biological invasions. |
| | Applied Ecophysiology | The course material discusses principles of physiological ecology and their application. Students will learn the basics of tree physiology, dendroecology and physiological ecology of animals living in the forest. Special emphasis will be put on changing abiotic conditions on organizmal ecology. |
| **Bioconservation** | Ecosystem Functioning | The first part of the lectures will provide general information on the structure and functioning of ecosystems. The second part of the lectures, on the other hand, deals with more detailed information on the structure and functioning of aquatic ecosystems. |
| | Advanced techniques in environmental data analysis | Introduction to advanced methods and applications of environmental data analysis and research planning. |
| | Environmental impacts of genetically modified organisms | The lecture Environmental impacts of genetically modified organisms for Global Change Biology students aims to present current knowledge in the field of genetically modified organisms (GMO) and their potential impact on others organisms and the environment. During the lecture students learn about types of genetical modifications, molecular biology methods for creation of GMO, benefits and hazards of GMO for humans and for the environment. The lecture provides |

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| | | students with up-to-date knowledge about GMO and allows them to critically discuss pros and cons of GM organisms. |
| | Applied ecosystem services | Lectures provide an introduction to natural capital and ecosystem services assessment and to environmental accounting methods.<br>The tutorials and discussion seminars will be dedicated to introducing students to the theoretical principles of natural capital and ecosystem services, as well as presenting practical methods for assessing ecosystem services provided by trees in urban ecosystems and conducting life cycle assessments of selected products, using appropriate software. |
| | The future of land use | A course on the future of land use is designed to provide students with a comprehensive understanding of how land will be utilized and managed in the years to come. It explores the evolving dynamics, challenges, and opportunities related to land use in the context of changing demographics, environmental concerns, and societal needs. |
| | The last of the wild: European protected areas | The course presents properties of most valuable national parks and nature reserves across Europe, with attitude and conservation methods in various kind of habitat. |
| | Applied statistics and spatial analysis in GIS | The aim of the course is to present basic information on GIS methods (principles of system operation and its components, methods of collecting and basic data analysis) and modelling natural phenomena, e.g. changes in species ranges and biodiversity on a local and global scale. |
| | Case studies in global change | As part of the course "Case studies in global change", students learn more about eukaryotic parasitic organisms among Protista and Animalia interacting with the host. Learn more about the possibilities of global quantitative and qualitative changes involving heteroxenic and holoxenic parasites |
| **Social and legal affairs** | European legal regulations in environmental protection | The aim of the subject is to present of the objectives, assumptions and essence of environmental protection issues in European law, along with a description of the legal basis of international cooperation in this area. |
| | Socioeconomic aspects of global change | The aim of the class is to discuss the relationship between scientific, economic, social, ethical and political factors in the dramatic context of global environmental challenges of the XXI century.<br>We will learn and talk about such problems as environmental planetary crisis, planetary boundaries, the challenges of the Anthropocene, the current role of sustainable development politics, green deals, ecological economics, decoupling, degrowth and globalism. We will focus on the most important threats of the contemporary world and the role of possible innovative methods of solving problems. The ability to identify and analyze the main challenges faced by the |

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| | | global community will be developed. In addition, special attention will be paid to the gathering of facts and developing the skills of critical analysis of the global threats to the stability of the society. |
| **Diploma project and diploma examination** | Thesis Lab | The course aims at getting acquainted with the reach Focus and methodology of the chosen department, as well as preparing the master thesis. The lab prepares a student to be able to formulate a research topic to devise a study plan, to reach out for the appropriate literature, to conduct empirical research, to analyse and interpret data and to write down the master thesis. |
| | Thesis of Specialization | Student formulate a research topic to devise a study plan, to reach out for the appropriate literature, to conduct empirical research, to analyse and interpret data and to write down the master thesis. |

This study programme is effective as of winter semester of the academic year 2025/2026.