GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Ecosystem biology , PG_00057780 | | | | | | |
| Field of study | Green Technologies | | | | | | |
| Date of commencement of studies | October 2022 | | Academic year of realisation of subject | 2023/2024 | | | |
| Education level | first-cycle studies | | Subject group | Optional subject group | | | |
| Mode of study | Full-time studies | | Mode of delivery | at the university | | | |
| Year of study | 2 | | Language of instruction | English | | | |
| Semester of study | 3 | | ECTS credits | 3.0 | | | |
| Learning profile | general academic profile | | Assessment form | assessment | | | |
| Conducting unit | Department of Microbiology -> Faculty Of Chemistry -> Wydziały Politechniki Gdańskiej | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. inż. Anna Brillowska-Dąbrowska | | | | |
| | Teachers | | | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 30.0 | 0.0 | 0.0 | 45 |
| | E-learning hours included: 0.0 | | | | | | |
| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | | Participation in consultation hours | Self-study | SUM | |
| | Number of study hours | 45 | | 5.0 | 25.0 | 75 | |
| Subject objectives | Expanding knowledge of the interdependence between the environment and the organisms inhabiting itbiosphere, ecotoxicology and toxicity testing, mutagens and environmental mutagenesis, biomarkers andbasic bioindication issues. | | | | | | |

Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [K6_U04] capable of formulating and solving design tasks in the field of environmental technology to recognize their non-technical aspects, including environmental, economic and legal. Is capable of applying the principles of occupational health and safety. Is able to make initial assessment of engineering solutions and actions | The student understands the essence of the impact of the state of the environment on society, economy and economics. | [SU3] Assessment of ability to use knowledge gained from the subject<br>[SU2] Assessment of ability to analyse information |
| [K6_W04] is aware of the importance of environmental protection and has a basic knowledge of chemical and biological threats to the environment, with particular emphasis on anthropogenic factors, has a basic knowledge of knowledge of the principles of sustainable development as well as national and European environmental management conditions. | The student understands the validity of EU green policies and sustainable development | [SW1] Assessment of factual knowledge<br>[SW2] Assessment of knowledge contained in presentation |
| [K6_K01] understands the need for learning throughout life, can inspire and organize the learning process of others. Is aware of his/ her own limitations and knows when to ask the experts, can properly identify priorities for implementation, critically evaluate his knowledge | The student takes the test toxicity on plants target assessment of the state of the environment<br>soil.<br>Can instruct colleagues how to perform the test. Is able to interpret the results of this test | [SK1] Assessment of group work skills<br>[SK2] Assessment of progress of work |
| [K6_U01] is able to obtain information from literature, databases and other sources, is able to integrate the information obtained, to make their interpretation, as well as draw conclusions and formulate and justify opinions, take part in the discussion | The student applies knowledge about<br>lichens to assess the degree air pollution. | [SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject |

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| Subject contents | Explanation of the term biology and environmental biology. Development of biology at the turn of the century.Characteristics of selected groups of organisms inhabiting the biosphere. Prokaryotic organisms ieukaryotic, cell structure. Biotic and abiotic elements, basic concepts related toecology and environmental protection. Genome as the total genetic information of a cell. Genomesprokaryotic and eukaryotic. Mutations, mutagens and environmental mutagenesis. Impact assessmentgenotoxic caused by environmental pollutants (mutation detection testspoint Ames test; cytogenetic and molecular tests, micronucleus method, comet test, Tunel test,fluorescence in situ hybridization, FISH). Biomarkers in the assessment of environmental exposureorganisms to pesticides and other toxic compounds. Biomarker classification. Brakingacetylcholinesterase (AChE) and delta aminolevulinic acid dehydratase (ALAD), respectively, byorganophosphates and organochlorine pesticides, pyrethroids and lead as an extremely toxic heavy metal.Reducing the activity of coagulation system proteins by coumarin and its derivatives. Induction of vitellogenin(by estrogenic contamination in male fish) and monooxygenases (by organochlorine compounds,polycyclic aromatic hydrocarbons). Masculinization of female snails induced byandrogenic impurities. Porphyrin profiles and heme group synthesis (disorders of the biosynthetic pathwayheme induced e.g. by organochlorine compounds, drugs and other xenobiotics). Basics of ecotoxicology.Toxic substances and measurable toxic effects (LC50, LD50, NOED, NOEC, EC50, ED50). Characteristicstest organisms. Bioindication as a method of environmental assessment. Classification and review of bioindicators(natural environmental species and farmed species). Toxicity classification system, screening test anddilution test for the analysis of environmental samples (sample classes). Overview of toxicity testsbased on terrestrial and aquatic organisms. Toxicity tests based on cryptobiotic formsbioindicators. Lichens as bioindicators of air pollution. The sensitivity of lichens topollution. Lichen scale and transplantation of thalli from slightly polluted areas to the studied areas.Lichen transplantation methods used in atmospheric air biomonitoring. Meaninglichens in nature and human economy<br><br>LABORATORIES<br><br>Organizational activities. Familiarization with occupational health and safety (OHS) regulations in the laboratoryexperimental and handling biological material. Methods of determining the numbermicroorganisms in natural environments. Determination of the number of bacteria by culturesurface and deep. Determination of the number of microorganisms in the tested material using the methodtiter and NPL (most probable number of microorganisms based on the Mac statistical tableCrady). Microbiological analysis in assessing the sanitary condition of soil, water and air.Identification of ammonifying bacteria in soil samples. Observations of bacterial growth (turbidity of the medium,presence of scum, sediment), analysis of the pH of the substrate and the presence of ammonia using Nessler's reagent.Determination of the total number of bacteria and fungi in the air using the sedimentation method. Presence identificationcoliform bacteria in tested water samples using the test tube fermentation methodmedia with lactose and bromocresol purple as an alkacimetric indicator (LPB, Eijkman's medium),determining the titer of coli bacteria (coliform titer). Tests confirming the presence of coliform bacteria.Inoculation of the tested water samples on Mac Conkey medium. Analysis of grown bacterial colonies throughGram stain is a complementary identification method. Plasmid DNA extraction and analysisisolated from bacterial cells. Electrophoretic separation of plasmid DNA in agarose gel.Analysis of the degree of toxicity of the soil environment in relation to test plant species (Sorghum saccharatum, Lepidium sativum, Sinapis alba) using a microbioassayphytotoxicity (Phytotoxkit). Determining the degree of inhibition of seed germination and root growthlength of the tested plants in the presence of toxic compounds in the soil in relation to the control soil(three repetitions, 2 exercises). Growth inhibition analysis based on aquatic plantshigher Spirodela polyrhiza based on the Spirodella DUCKWEED microbiotest for testing puresubstances, sewage, surface and deep water. Preparation of media (for growth and fordilutions), a series of dilutions of the tested sample, turions for germination. Area measurementthe largest leaf of each germinating turion in each test well at the beginning and end of the test, intested water samples in relation to the control (two repetitions, 2 exercises). Summaryobtained research results. |
| Prerequisites and co-requisites | |
| Assessment methods and criteria | |

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| verification tests (laboratories - 6 tests) | 60.0% | 25.0% |
| reports (laboratories) | 60.0% | 25.0% |
| test (lectures) | 60.0% | 50.0% |

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| Recommended reading | Basic literature | Indicated by the teacher during the first class.Depending on availability in the PG library |
| | Supplementary literature | Scientific papers |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | Characteristics of selected groups of organisms inhabiting the biosphere.Biomarkers in the assessment of exposure of organisms to toxic compounds introduced into the environment. | |
| Work placement | Not applicable | |

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