**SYLLABUS** (MODULE-ERASMUS+)

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| Course/module (as specified in the approved curriculum for the field of study)  **Biological monitoring** | | | | | | ECTS  **3** | | Component code  **ENVI 2.1** | |
| Name in Polish  **Biomonitoring** | | | | | |
| Unit(-s) providing the course/module (Faculty, Institute/Department)  **Faculty of Environmental and Mechanical Engineering, Department of Ecology and Environmental Protection** | | | | | | | | | |
| Head of course/module (e-mail address)  **Daniel Gebler, PhD (**[**daniel.gebler@up.poznan.pl**](mailto:daniel.gebler@up.poznan.pl)**)** | | | | | | | | | |
| Other teachers  **Krzysztof Szoszkiewicz, Prof.; Klaudia Borowiak, Prof.; Marta Lisiak-Zielińska, PhD** | | | | | | | | | |
| Course category  **Open** | | Language  **English** | | Level  **Bachelor/Master** | Profile  **Academic-general** | | Semester  **Winter/Summer** | | |
| **TYPE OF CLASSES/LECTURES AND THE NUMBER OF HOURS**  (organised classes/lectures and self-study) | | | | | | | | | |
| Type of studies: full-time | | |  | Type of studies: extramural | | | | |  |
| * lectures | | | 15 | * lectures | | | | | - |
| * practical classes | | | 15 | * practical classes | | | | | - |
| * field exercise | | | - | * field exercise | | | | | - |
| * other lessons | | | - | * other lessons | | | | | - |
| * self-study | | | 45 | * self-study | | | | | - |
| Total number of hours: | | | 75 | Total number of hours: | | | | | - |
| **PRE-REQUSITES**  Basic knowledge in biology. | | | | | | | | | |
| **OBJECTIVE OF COURSE/MODULE**  Biological monitoring systems used in air, soil and water assessment. Ecological principals in biological assessment methods. Biomonitoring systems of assessment based on living organisms (lichens, higher terrestrial plants, macrophytes, aquatic fauna). Biomonitoring systems implemented to meet the requirements of new directives of the European Union in the field of environmental protection and nature conservation. | | | | | | | | | |
| **TEACHING METHODS**  Lectures based on multimedia presentation with elements of discussion.  Practical classes: individual project, field trips.  Possibility to use distance learning tools and techniques. | | | | | | | | | |
| **LEARNING OUTCOMES** | | | | | | | Reference  to field outcomes | | |
| Knowledge | O1: Students understand the functioning of biotic and abiotic elements of the environment (air, soil, water, plants and animals).  O2: Students have knowledge of mechanisms and processes in the environment.  O3: Students know different kinds of hazards and methods of their identification, reduction or elimination from the environment. | | | | | | Not  applicable | | |
| Skills | O4: Students gain to acquire, verify, evaluate and integrate environmental and geographical data from various sources.  O5: Students have the skills to utilize obtained data for environmental and anthropogenic impact assessments.  O6: Students are able to conduct multi-faceted analyses of natural environmental conditions and processes. | | | | | | Not  applicable | | |
| Social  competences | O7: Students know how to apply obtained knowledge about the environment for engineering solutions.  O8: Students are able to independent or team work to solve the problem. | | | | | | Not  applicable | | |
| **METHODS TO VERIFY LEARNING OUTCOMES**  Written assignment or multimedia presentation.  Reports from the field exercises.  Written exam. | | | | | | | Outcome Reference  Numbers  O1, O2, O3, O4, O5, O6, O7, O8 | | |
| **TEACHING CONTENT**  **Lectures:** Ecological basics of bioindication. Limiting factors and tolerance of organisms. Types of bioindicators. Fundaments of phytosociology and the principles of identifying plant communities and habitats. Application of the phytosociological system in the implementation of European directives. Application of biological methods and bioindication tests in the assessment of the environment and ecosystem changes. Hydrobiological methods and indicators in the assessment of the state and changes in water ecosystems. Assessment of the ecological status of waters. Sources and types of pollution. Influence of air pollution on plants. Types of plant reactions to air pollutants. Legal and organizational foundations for the functioning of air monitoring. Forest ecological disaster in mountains.  **Practical classes:** Phytosociological characteristics of terrestrial and aquatic communities - recognition of indicator species. Evaluation of the indicative value of selected phytocoenoses based on the indicator numbers (values). Organisms used in the assessment of the ecological status of waters. Macrophyte method in the assessment of flowing and stagnant waters. Observations and recognition of aquatic indicators (macrophytes, invertebrate animals). Early warning systems in the detection of drinking water hazards in water supply systems. Air pollution monitoring and biomonitoring programs. Air monitoring in Poland and in the world. Biomonitoring of air pollutants. Bioindication plants for selected air pollutants. Identifying visible reactions to the presence of certain air pollutants. Threats to the forest environment with air pollution. Health condition of forests. Methods of the impact assessment of air pollution on forest ecosystems. | | | | | | | | | |
| **Forms and criteria for passing of course/module**  Final written exam.  Reports/presentations evaluation and completion. | | | | | | | Percentage of final mark  60%  40% | | |
| **LIST OF LITERATURE**   1. M.E. Conti (ed.) 2008. Biological Monitoring. Theory and Applications. WittPress. 2. Layer E. 2015. Environmental Monitoring. Callisto Reference. 3. Layer E. 2015. Handbook of Environmental Monitoring. Callisto Reference. 4. Begon M., Colin B., Townsend R., Harper J.L. 2017. Ecology: From Individuals to Ecosystems. Wiley-Blackwell. 5. Mackenzie A., Ball A. S., Virdee S. R.2015. Ecology. Instat notes. Taylor & Francis. 6. Technical Reports of ICP Forests (http://icp-forests.net/). | | | | | | | | | |