**SYLLABUS** (MODULE-ERASMUS+)

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| Course/module (as specified in the approved curriculum for the field of study) **Fundamentals of land improvement** | ECTS**3** | Component code**ENVI 1.3** |
| Name in Polish**Podstawy melioracji** |
| Unit(-s) providing the course/module (Faculty, Institute/Department)**Faculty of Environmental and Mechanical Engineering, Department of Land Improvement, Environmental Development and Spatial Management** |
| Head of course/module (e-mail address)**Rafał Stasik, Prof. UPP (rafal.stasik@up.poznan.pl)** |
| Other teachers**Barbara Kęsicka, MSc** |
| Course category**Open** | Language**English** | Level**Bachelor/Master** | Profile**Academic-general** | Semester**Winter** |
| **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 of hydrology, soil properties and ecology. |
| **OBJECTIVE OF COURSE/MODULE**Knowledge of land improvement role in agricultural productivity development. The history of land improvement systems. Basic knowledge of hydrology. Knowledge of different methods of land improvement accordance to their aims and applications in different environment and habitat conditions. Methods of regulation of air-water conditions in arable areas using different drainage and open ditch systems. Knowledge of methods of calculating basic parameters of drainage systems. Knowledge of different methods of road drainage and urban areas. Basis of land improvement and sustainable management in forest. Fundamentals of soil erosion threat and erosion control methods. |
| **TEACHING METHODS**Lectures with multimedia presentation. Practical classes: making the project of land improvement at arable area using drainage system and assessment of soil erosion intensity using USLE formula. Possibility to use distance learning tools and techniques. |
| **LEARNING OUTCOMES** | Referenceto field outcomes |
| Knowledge | O1: Students will have advanced knowledge about water resources in environment, will know an impact of natural and anthropogenic factors on water resources.O2: Students will know methods of regulation of soil air-water regime; has knowledge of impact of water lack or excess on plant growth conditions and soil productivity.O3: Students will know about exploitation of devices and systems related to environmental engineering, land improvement devices and hydro engineering. | Notapplicable |
| Skills | O4: Students will have skills to choose the most proper method of air-water regime in soil having regard of sustainable development rules as well as environment protection.O5: Students will be able to determine land improvement system parameters and accomplish a draft of drainage system.   | Notapplicable |
| Socialcompetences | O6: Students will be aware the significance of non-technical aspects and effects of engineering activity, including the impact on environment and will be aware the responsibility of making decision. | Notapplicable |
| **METHODS TO VERIFY LEARNING OUTCOMES**Two drafts accomplishment and passing colloquium. Written or oral exam. | Outcome ReferenceNumbersO1, O2, O3, O4, O5, O6 |
| **TEACHING CONTENT****Lectures**: Basic terms, definitions aims and range of land improvement. Land improvement functions in agriculture and soil water management. Land improvement history in Poland and in the world. Condition and contemporary purposes and tasks of land improvement. The methods of regulation and adjustment water condition in excessively moist and wet area. Evaluation the drainage needs with consideration of environment protection requirements. Causes, symptoms and effects of excessive moisture at agricultural area. Methods of evaluation and computing the basic drainage parameters. Principles of drawing the land improvement devices in a different habitats. Open dich and tile drainage systems. Drainage system parameters assessment. New technics and technology in drainage. Drainage water management system. Drainage systems in urban area and communication road. Main factors of soil erosion intensity and existence. The methods of wind and water erosion protection. Basic principles of land improvement in forested area.**Practical classes:** 1. Drawing the pipe drainage system at arable area, consisting of evaluation of drainage needs, choice of optimum pipe drainage method, computing the basic parameters of drainage system, topographic map in 1:2000 scale with scheme of drainage net, tables with length of drains and collector drains, table of drained area, tables of wells and outlets collation, drainage collectors profiles in 1:100/2000 scale, technical description of the draft.
2. Calculation of soil erosion intensity according to USLE formula.
3. Exercises and presentation.
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| **Forms and criteria for passing of course/module** Mark of the classes: mark of drafts – 50%, colloquium – 50%.Final examination mark: mark the oral or writing examination. | Percentage of final mark30%70% |
| **LIST OF LITERATURE** 1. Ritzema, H. P. (2006). Drainage principles and applications (No. 16). ILRI.
2. Nijland, H., Frank W. Croon, and Henk P. Ritzema. (2006) Subsurface drainage practices: guidelines for the implementation, operation and maintenance of subsurface pipe drainage systems. No. 60. ILRI.
3. US Department of Agriculture, Natural Resources Conservation Service (2008) Part 650: Engineering Field Handbook National Engineering Handbook, chapt. 13 – Wetland restoration, Enhancement, or creation.
4. US Department of Agriculture, Natural Resources Conservation Service (2001) Part 650: Engineering Field Handbook National Engineering Handbook, chapt. 14 – Water management (drainage).
5. Michel M. Bloomberg, Carter H. Strickland, (2012) Guidelines for the design and construction of stormwater management systems, NYC Department of Environmental Protection.
6. Stormwater and drainage system manuals of different manufacturers available in pdf files by www.
7. USLE model guidelines available in pdf files by www.
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