**SYLLABUS** (MODULE-ERASMUS+)

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| Course/module (as specified in the approved curriculum for the field of study) **On-site wastewater treatment systems** | ECTS**4** | Component code**ENVI 1.1** |
| Name in Polish**Indywidualne systemy oczyszczania ścieków** |
| Unit(-s) providing the course/module (Faculty, Institute/Department)**Faculty of Environmental and Mechanical Engineering, Department of Hydraulic and Sanitary Engineering** |
| Head of course/module (e-mail address)**Marcin Spychała, PhD (****marcin.spychała@up.poznan.pl****)** |
| Other teachers- |
| 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
 | 14 | * lectures
 | - |
| * practical classes
 | 28 | * practical classes
 | - |
| * field exercise
 |   | * field exercise
 | - |
| * other lessons
 |  - | * other lessons
 | - |
| * self-study
 |  58 | * self-study
 | - |
| Total number of hours: | 100 | Total number of hours: | - |
| **PRE-REQUSITES**Basics of mathematics and physics. |
| **OBJECTIVE OF COURSE/MODULE**To acquaint students with modern on-site domestic wastewater treatment systems and to develop their skills in evaluation of on-site conditions and environmental impact of the treated wastewater. |
| **TEACHING METHODS**Lectures, classes including field tests.Possibility to use distance learning tools and techniques. |
| **LEARNING OUTCOMES** | Referenceto field outcomes |
| Knowledge | O1: Students have an established knowledge about the design of on-site wastewater treatment systems with regard to the principles of their reliability. O2: Students have knowledge of the selection of the technology minimizing the negative impact of human pressure on the environment.O3: Students have an extended knowledge of installations and technology related to on-site wastewater treatment systems. | Notapplicable |
| Skills | O4: Students will have skills to select the technology to minimize the negative impact of human pressure on the environment taking into account the possibility of protection of soil, groundwater and surface water from pollution.O5: Students will be able to design on-site wastewater treatment systems. | Notapplicable |
| Socialcompetences | O6: Students will think and act in a creative manner.O7: Students will be able to cooperate with other students in the group. | Notapplicable |
| **METHODS TO VERIFY LEARNING OUTCOMES**Design project and examinations.Written/oral exam. | Outcome ReferenceNumbersO1 – O7 |
| **TEACHING CONTENT****Lectures:**1. Sanitation state in Europe and in the world.
2. Raw wastewater characteristics and allowed pollution concentrations in the treated wastewater.
3. Methods of wastewater treatment – classifications and basic unit processes.
4. Processes taking place in the septic tank.
5. Principles of design, construction and operation.
6. Pre-treated effluent filtration systems.
7. Constructed wetlands.
8. Clogging and de-clogging.
9. Long term acceptance rate and percolation tests.
10. PN-EN 12566 standard/technical report.
11. On-site wastewater treatment systems – comparison.
12. Wastewater reuse.
13. Processing and utilization of sewage sludge.

**Practical classes:** Design project of a small wastewater treatment plant for an individual homestead. Performance of percolation test to estimate hydraulic conductivity of the native soil. |
| **Forms and criteria for passing of course/module** Score from classes (design project).Written/oral exam. | Percentage of final mark40%50% |
| **LIST OF LITERATURE** 1. US EPA. Onsite Wastewater Treatment Systems Manual (2002) https://www.epa.gov/sites/production/files/ 2015-06/documents/2004\_07\_07\_septics\_septic\_2002\_osdm\_all.pdf
2. EN 12566 - Small wastewater treatment systems for up to 50 PE
3. NSAI (2014) Guidance on the selection, installation and use of small wastewater treatment systems for domestic wastewater up to 50 PE
4. Spychała M., Pilc L. (2011) Can Earthworms De-Clog Sand Filters? Polish Journal of Environmental Studies, Vol. 20, No 4, 1037-1401
5. Spychała M., Pawlak M., Makowska M. (2020) Influence of solids contained in septic tank effluent on lifespan of soil infiltration systems, 181, 204–212
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