**SYLLABUS** (MODULE-ERASMUS+)

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| Course/module (as specified in the approved curriculum for the field of study) **Application of remote sensing in environmental studies** | ECTS**4** | Component code**ENVI 4.2** |
| Name in Polish**Zastosowania teledetekcji w badaniach środowiska przyrodniczego** |
| 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)**Joanna Jaskuła, PhD (****joanna.jaskula@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
 | 15 | * lectures
 | - |
| * practical classes
 | 35 | * practical classes
 | - |
| * field exercise
 |   | * field exercise
 | - |
| * other lessons
 |  - | * other lessons
 | - |
| * self-study
 |  50 | * self-study
 | - |
| Total number of hours: | 100 | Total number of hours: | - |
| **PRE-REQUSITES**Basics of environmental sciences and GIS. |
| **OBJECTIVE OF COURSE/MODULE**The aims of this course are to get knowledge of remote sensing basics (aerial and satellite imagery) and have experience with geospatial software, particularly ArcGIS, QGIS and SNAP software. After course students will develop a strong understanding of the tools and techniques used to implement, process and interpret remotely sensed data to environmental applications. |
| **TEACHING METHODS**Multimedia presentation, video guide.Group discussionPossibility to use distance learning tools and techniques. |
| **LEARNING OUTCOMES** | Referenceto field outcomes |
| Knowledge | O1: Students will have advanced knowledge of remote sensing adapted for environmental purposes.O2: Students will know how to collect and process remotely sensed data to make it useful in geographic information systems. | Notapplicable |
| Skills | O3: Students will have skills to extract information from remotely sensed data using manual and automated techniques.O4: Students will have skills to collect, process and use remotely sensed data for environmental purposes.O5: Students will have skills to assess the strengths and weaknesses of remote sensing | Notapplicable |
| Socialcompetences | O6: Students will be able to work in groups taking on varied roles and clearly communicate findings from the analysis of remotely sensed data.O7: Students will understand the importance of update knowledge and skills in using remotely sensed data for environmental purposes. | Notapplicable |
| **METHODS TO VERIFY LEARNING OUTCOMES**ExamFinal projectColloquium | Outcome ReferenceNumbersO1, O2, O3, O4, O5, O6, O7  |
| **TEACHING CONTENT****Lectures**: 1. Introduction to remote sensing.
2. History of remote sensing.
3. Physical basis of remote sensing.
4. Active and passive systems.
5. Sensor types and acquisition platforms.
6. Principles of remotely sensed data (aerial photography and satellite imagery).
7. Remote sensing applications in the environmental studies.

**Practical classes:** 1. Characteristics of remotely sensed data.
2. Data collection - acquiring imagery and terrain data.
3. Pre-processing (radiometric and geometric correction, composite).
4. Visual interpretation of remotely sensing data.
5. Classification methods (supervised and unsupervised classification).
6. Accuracy assessment – interpretation of Kappa coefficient.
7. Spectral indices – calculation and interpretation for environmental purposes.
8. SNAP software – introduction.
9. Georeferencing methods.
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| **Forms and criteria for passing of course/module** Criteria for lectures: - result of exam - active participation in classes - attendance Criteria for classes: - result of colloquium - final project- active participation in classes | Percentage of final mark85%10%5%55%35%10% |
| **LIST OF LITERATURE** 1. Thenkabail P. (2018). Remote Sensing Handbook-Three Volume Set. CRC Press.
2. Chuvieco E. (2016). Fundamentals of satellite remote sensing: An environmental approach. Second edition. CRC Press/Taylor & Francis.
3. Guo H., Fu W., Liu G. (2019). Scientific Satellite and Moon-Based Earth Observation for Global Change. Springer.
4. Lillesand T., Kiefer R.W., Chipman J. (2015). Remote sensing and image interpretation. John Wiley & Sons.
5. Jiang Z., Shekhar S. (2017). Spatial Big Data Science: Classification Techniques for Earth Observation Imagery. Springer.
6. Jaskuła J., Sojka M., Wicher-Dysarz J. (2019). Analysis of selected physicochemical parameters and degradation process assessment in a two-stage reservoir Jezioro Kowalskie using field and remote sensing data. Annual Set the Environmental Protection, 21(1), 439-455.
7. Jaskuła J., Sojka M. (2019). Assessing spectral indices for detecting vegetative overgrowth of reservoirs. Polish Journal of Environmental Studies, 28(6), 4199–4211.
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