MODULE INFORMATION SHEET

Name of Module Unit	**Remote Sensing Imagery Processing**
Name in polish language	Analiza zobrazowań satelitarnych
Module type	elective
Form of studying	full-time day courses
Level of study	undergraduate course (B.Sc. level)
Type of study (for extra-mural courses)	-
Programme	Environmental Engineering
Speciality	Environmental Engineering
Responsible department	Department of Informatics and Environmental Studies
Responsible person	Prof. dr hab. inż. Jarosław Zawadzki

Semester	Lectures(E)	Tutorials	Laboratory	Computer Exercises	Projects	ECTS
7	15			30	-	3

Objectives (summary)

The objective of the course is to teach the students basic skills of remote sensing imagery processing, as well as to give to them simultaneously preliminary concepts of remote sensing of the Earth surface and environment. The general approach of the course is task-based learning, with an emphasis on practical skills, supplemented by only necessary amount of theory. Beyond exploring the remote sensing imagery processing this course relates students to chosen relevant environmental issues. The exercises are intentionally based on ESA Sentinels imagery delivered by Copernicus Mission and ESA data infrastructure, especially Copernicus Open Access Hub. It is assumed that this course will be the base for further most advanced studies of remote sensing in the future.

Prerequisites

Calculus I, II, III, Information Technology, Physics I, II, Statistics in Environmental Sciences

Rules for integrated grade definition

Integrated grade is calculated from the formula: 0.5E + 0.5CE, where E is final exam grade (lectures), CE denotes for Computer Exercises. Student's activity will be taken also into account.

Recommended readings

1. Remote Sensing and Image Analysis https://nature.berkeley.edu/~penggong/textbook/
2. Fundamentals of Remote Sensing. The Canada Centre for Mapping and Earth Observation Tutorial https://www.nrcan.gc.ca/node/9309.
3. Digital-image-processing. Part-one and two (https://bookboon.com/en/digital-image-processing-part-one-ebook, https://bookboon.com/en/digital-image-processing-part-two-ebook).
4. Advanced Remote Sensing and GIS (Training Manual Developed by CEGIS, USFS and BFD, 2014-15)
http://bforest.portal.gov.bd/sites/default/files/files/bforest.portal.gov.bd/page/bb40dcf3_5140_

49c8_9b54_9b43993607ac/Advanced%20Remote%20Sensing%20And%20GIS.compressed.pdf
5. Campbell J.B., Introduction to remote sensing. Wyd. 4. Taylor & Francis, 2006. str. 437.
6. Remote Sensing and Image Interpretation, 6th Edition, Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman (University of Wisconsin, Madison), 2008.
Exemplary pages on remote sensing and image interpretation:
Internet sources:
Copernicus Europe's eyes on Earth https://www.copernicus.eu/en
European Space Agency Education
http://www.esa.int/SPECIALS/Education/
NASA Education
http://www.nasa.gov/audience/forstudents/index.html
Land processes distributed active archive center webpage
https://lpdaac.usgs.gov/
Canadian Space Agency: http://www.asc-csa.gc.ca/eng/Default.asp
Bilko Home Page
http://www.learn-eo.org/index.php
http://www.learn-eo.org/software.php

Contents of lectures (syllabus)

	Topics	**Time** (hrs.)	**Scope** (S / Ex)
1	Elements of physics of the Earth remote sensing.	2	S
2	Different types of remote sensing images and their properties. Spatial, spectral, radiometric and time resolutions. Images formats.	1	S
3	Satellite image preprocessing. Geometric correction, radiometric (sensor) calibration, atmospheric correction, topographic correction of satellite images.	2	S
4	Image enhancement. Histogram based transformations. Common filtering procedures. Low and high-pass filters. Multi bands image transformations. Remote sensing indices.	2	
5	Advanced image enhancement, e.g. principal components analysis, Fourier analyses.	2	Ex
6	Supervised and unsupervised methods of classification. Accuracy assessment: user's and producer's accuracy, Kappa coefficient.	2	S
7	Chosen problems and examples of processing satellite imagery of environmental based on scientific literature related to optical microwave remote sensing products.	3	Ex
8	Final exam	1	
	Total	**15**	**hours**

S – topics listed in the legal study programme standards from 12.07.2007
Ex – extended topics

Lecturers

Prof. dr hab. inż. Jarosław Zawadzki

Assessment method

Final exam

Contents of computer exercises

	Topics	Time (hrs.)	Scope (S / Ex)
1	Introduction. Satellite imagery Sources - Space HUB.	2	S
2	Introduction to SNAP. Opening, viewing and saving images.	2	S
3	Colour Manipulation. RGB composition.	2	S
4	Reprojection and Digital Elevation Model.	2	S
5	Band Math and Masking.	2	S
6	Vegetation Indices	2	S
7	Chosen analysis tools	4	S
8	Comparison of unsupervised and supervised classification.	4	S
9	Basics of microwave remote sensing processing	2	
10	Student project – made using previously introduced RS techniques on chosen subject.	6	S
11	Final test	2	S
	Total	**30**	**hours**

S – topics listed in the legal study programme standards from 12.07.2007
Ex – extended topics

Persons responsible for computer exercises

Dr inż. Karol Przeździecki

Assessment method for computer exercises

The presence and active participation (30%), passing the final test (70%).