MODULE INFORMATION SHEET

Name of Module Unit	**Introduction to Remote Sensing of Environment**
Name in polish language	Wstęp do teledetekcji środowiska
Module type	compulsory
Form of studying	full-time day courses
Level of study	graduate course (M.Sc. level)
Type of study (for extra-mural courses)	-
Programme	Environmental Engineering
Speciality	Environment Protection 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
3	15			30		3

Learning outcomes (knowledge, skills, competences)

The objective of the course is to teach the students the fundamental concepts of remote sensing of earth surface and give to them basic skills of remote sensing image processing. The general approach of the course is task-based learning, with an emphasis on computer practice, supplemented only by necessary amount of theory. Beyond exploring the principles of remote sensing this course relates them to environmental problems and analysis. The course is based mainly on UNESCO Bilko remote sensing learning system.

Prerequisites

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

Rules for integrated grade setting

Integrated grade is calculated from the formula: 0.5E + 0.5CE, where E is final exam grade, CE denotes for home works and active participation.

Recommended readings

1. Jensen, J.R. (1986) Introductory Digital Image Processing: A Remote Sensing Perspective. Prentice-Hall, New York, 1986.
2. Barrett, E.C. and L.F. Curtis (1992) *Introduction to Environmental Remote Sensing*, 3rd edition. Chapman and Hall, London, 1992.
3. 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:
UNESCO Bilko Home Page
http://www.noc.soton.ac.uk/bilko/index.php
Eeuropean Space Agency Education
http://www.esa.int/SPECIALS/Education/
NASA Education
http://www.nasa.gov/audience/forstudents/index.html

Contents of lectures (syllabus)

	Topics	Time (hrs.)	Scope (S / Ex)
1	Electromagnetic energy and remote sensing. Fundamentals of remote sensing.	2	S
2	Phenomena related to solar radiation in the atmosphere. Energy interaction with the earth's surface. Spectral reflectance curves.	2	
3	Sensors, platforms, satellite orbits, remote sensing data acquisition systems. Specific properties of remote sensing data – an introduction.	2	S
4	Optical and thermal remote sensing	1	S
5	Microwave remote sensing, Synthetic Aperture Radar (SAR), Interferometric synthetic aperture radar, (InSAR) remote sensing, Lidar.	2	S
6	Global Earth Observation System of Systems, an overview of contemporary ESA's space missions.	2	S
7	Soil Moisture and Ocean Salinity Mission as an example of ESA's Living Planet mission.	2	Ex
8	Remote sensing in environmental applications. Local scale applications. The latest advances in the field.	2	S
	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	Geometric correction of an Advanced Very High Resolution Radiometer (AVHRR) image, of the Mediterranean Sea.	2	S
2	Covariance and correlation matrices and interpreting principal components analysis loadings	2	S
3	Advanced uses of formula documents, including Boolean algebra, trigonometric functions, modular arithmetic	2	S
4	The aim of this lesson is to show how a stacked set of raster layers can be manipulated as a simple Geographic Information System (GIS) using formula documents to perform the necessary operations.	2	S
5	Applying geographical coordinate grids to images	2	S
6	Opening binary flat files in Bilko	2	
7	Using MERIS level 1B data as an example, this lesson shows how to use the bit-wise operators of formula documents with flag coding information that is provided with some images.	2	S

8	This lesson introduces a range of two-band and three-band vegetation indices, explores how to use Bilko formula documents to implement these, and explains how libraries of generic formulae (in this case, for mapping vegetation) can be created.	2	S
9	Supervised classification of land cover and assess its accuracy using ground-truthing survey data, then to learn how to carry out an unsupervised classification and compare the outputs of each method.	4	S
10	Calculating thermal stress and predicting coral bleaching. This lesson teaches how to use NOAA Coral Reef Watch (CRW) data based on satellite measurements of sea surface temperature (SST) to predict coral bleaching.	4	Ex
11	Advanced individual projects	6	
	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. Piotr Fabijańczyk

Assessment method for computer exercises

Accomplishment computer exercises participation, active participation, final test.