Course title: **Satellite Remote_Sensing**

ECTS credit allocation (and other scores): 4

Semester: spring

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 30

Course coordinator/ Department and e-mail: **Marek Mróz**, marek.mroz@uwm.edu.pl [French speaking also]

Type of classes: classes and lectures

Substantive content

CLASSES: EU Copernicus program and ESA EO missions: satellite services and data; DIAS; Sentinel-2; Copernicus ecosystem; SNAP. Preprocessing of time series of Sentinel-2 images. Color compositions – oif; Spectral transformations - indices. Unsupervised classification of multi-spectral image: clustering. Principal Components Analysis. Unsupervised classification of multispectral image after PCA transformation.

LECTURES: Historical background of the development of remote sensing. Sources of information on remote sensing. Space agencies. Remote sensing satellites – elements of orbitography. Physical basis of remote sensing. Satellite image acquisition: scanner types, instrumental resolution, FWHM, luminance measurements, A/D conversion, radiometric calibration, TOA and BOA reflectance. Structures and formats of digital satellite imageries. Geometric transformations of satellite image: levels of geometric processing. Raster images in vector space: resampling. Basic operations of digital satellite image processing – visualizations, image histograms (one-dimensional, cumulative, two-dimensional), color compositions. Spatial filtration and algebraic operations. Principal Component Analysis. Digital classifications of satellite images: supervised and unsupervised "per pixel" classifications.

Learning purpose: Student has knowledge and skills in satellite remote sensing.
On completion of the study programme the graduate will gain:
Knowledge: Student has a wide-ranged knowledge of satellite remote sensing.
Skills: Student has competence in satellite remote sensing data processing and land use / land cover map compilation.
Social Competencies: Student is able to work efficiently in the team, organize team's cooperation during engineering projects.

Literature:
1. Jensen J.R. Introductory Digital Image Processing. A remote sensing perspective. 4th Edition. ISBN-13: 978-0-134-05816-0. Pearson 2015
2. Olsen R.C. Remote sensing from Air and Space. Second ed. SPIE PRESS 2018
3. Pratt W. Digital image Processing. John Wiley & Sons, Inc. ISBN 0-471-22132-5 (Electronic) 2001
4. Richards J.A., Remote Sensing Digital Image Analysis - An Introduction, Berlin - Heidelberg, 1993
5. Tempfli K. et al. Principles of Remote Sensing. ITC Enschede 2009. Digital issue.

The allocated number of ECTS points consists of:
Lectures and classes: 30 h
Student's independent work: 30 h