Photogrammetry and remote sensing P

Purpose of education:

a) knowledge

- He/she has a complex knowledge of the general cartographic, geographic, mathematical and informatics principles, rules and interrelationships necessary for the practice of cartography and geoinformatics, in particular in the following subjects: surveying (geodesy, topography, remote sensing, photogrammetry), map construction and design, projection, thematic cartography, geovisualisation, geoinformatics, building geographic information systems.
- Comprehensive knowledge of the principles, methods and procedures for the design, development and operation of geoinformatics, in particular in the following areas: operating systems and database management, design and development of web-based geoinformatics tools and services, geoinformatics-related programming principles, geospatial application development.
- Ability to create maps and geoinformatics systems that can be used by economic sectors or clients in the desired field.

b) abilities

- Ability to interpret and formalise complex professional problems in the field of cartography and geoinformatics, to identify the necessary theoretical and practical background and to solve the problem. Ability to provide consultancy, problem-solving, design, development, operation and management of cartographic and geoinformatics systems, decision support systems and expert systems.
- Ability to interpret, plan, organise, manage and control processes in the field of cartography and geoinformatics.
- Ability to work pro-actively, in project (team) work with specialists in cartography and geoinformatics, co-disciplines and other disciplines (e.g. geodesy, geology, geophysics, geography, meteorology, astronomy, statistics, history, archaeology, linguistics).

c) atitude

- Open and committed to critical feedback and evaluation based on self-reflection. Adopts and enforces with co-workers ethical principles of work and organizational culture, with particular attention to the copyright environment related to cartography and geoinformatics.
- It is committed to meeting and enforcing quality standards (accuracy, commitment).
- It attaches importance to the promotion and implementation of environmental awareness and sustainable development, and promotes this through the tools of cartography and geoinformatics.

d) **autonomy and responsibility**

- Able to work independently in IT, carrying out tasks, thinking through and developing technical issues in a self-directed manner and at a pace.
- Responsible for meeting and enforcing deadlines. Assumes responsibility for his/her own work and that of his/her colleagues working under his/her direction and with him/her (in a project).
- In the case of mission-critical mapping and geoinformatics systems, may be given development and operational responsibility appropriate with his/her professional competences.

Content of education:

During the practices, students gain insight into the theoretical foundations, technical background, and methods of photogrammetry and remote sensing. They become familiar with both imaging and non-imaging optical data collection, data processing, and their application possibilities. We overview the current state of active and passive remote sensing in terrestrial, aerial, and satellite systems, as well as its multidisciplinary context according to the current state of science. Emphasis is placed on industrial applications and their scientifically oriented approaches. We delve into the basics of digital image processing, general issues, related software, measurement results, and their usability. After the course, students will be able to form independent professional opinions and make choices regarding methods, software, and hardware.

Topics

The physical background of remote sensing, characteristics of different data types
Field equipments for optical data collection: measurement methodology and calibration of handheld multispectral and hyperspectral cameras and the spectroradiometer
Optical satellite systems: data sources and their characteristics, download options, procedures for improving spatial resolution, e.g. pansharpening

Optical satellite systems: pre-processing, data cleaning, characteristics and band composites
Optical remote sensing data classification possibilities and algorithms
Post-processing, cleaning, reclassification and change detection of remotely sensed data
Characteristics of radar remotely sensed data, preprocessing steps using SNAPTool, model creation (DEM/DSM)
Modeling of radar remotely sensed data: investigation of flood events, investigation of built-up areas
UAV systems and cameras
Photogrammetry solutions and software options; creating orthomosaics and DSM models, spherical modeling (Agisoft Metashape)
Features of LiDAR cameras; LiDAR point cloud processing, classification and modeling using LASTools
Thermal remote sensing: characteristics, data formats and cameras; evaluation methods
Dataspace Copernicus system usage knowledge, geoinformatics options, API and other connections
Student project work presentations

Evaluation system: practical mark based on course work

Literature:
Obligatory:

- Mucsi L. (2004) Műholdas távérzékelés. Libellus Kiadó. ISBN: 9632149033
- Fekete I., Hunyadvári L. (szerk.) (2014) Algoritmusok és adatszerkezetek I-II. Digitális egyetemi tankönyv, ELTE Informatikai Kar, ISBN 978-963-248-456-5
- Vohland, M., A. Jung, eds. (2020) Hyperspectral Imaging for Fine to Medium Scale Applications in Environmental Sciences. Remote Sens. 12(18), 2962; https://doi.org/10.3390/rs12182962

Recommended:

- Rossel, R. A. V., McBratney, A. B., Minasny, B. (Eds.). (2010) Proximal soil sensing. Springer Science & Business Media. ISBN 978-90-481-8859-8
- McCoy, Roger M. (2005) Field methods in remote sensing. Guilford Press, ISBN 9781593850791