COURSE OUTLINE

1. Study programme information

1.1 Higher education institution	Universitatea de Vest din Timişoara
1.2 Faculty / Department	Chimie, Biologie şi Geografie / Departamentul de Geografie
1.3 Sub-department	Geografie
1.4 Field of study	Geography
1.5 Level of study	Master's degree
1.6 Study programme / Qualification	Geographic Information Systems

2. Course information

2.1 Course title			Advanced processing of remote sensing data				
2.2 Course convenor/ Lecturer			Conf. univ. dr. Marcel Török-Oance				
2.3 Teaching assistant			Conf. univ. dr. Marcel Török-Oance				
2.4 Year of study	II	2.5 Semester	I	2.6 Type of assessment	E	2.7 Course type	DI

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	4	of which: 3.2 lecture	2	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	56	of which: 3.5 lecture	28	3.6 seminar/laboratory	28
Time distribution:					**hours**
Studying textbooks, course materials, bibliography and notes					20
Further research in libraries, on electronic platforms and in the field					25
Preparing seminars/ laboratories, homework, research papers, portfolios and essays					25
Tutoring					14
Examinations					10
Other activities ……					

3.7 Total hours of individual study	**94**
3.8 Total hours per semester	**150**
3.9 Number of credits	**6**

4. Prerequisites (if applicable)

4.1 based on curriculum	• Remote Sensing
4.2 based on competencies	• Basic knowledges of Remote Sensing

5. Conditions (if applicable)

5.1 for the course	Computer / laptop with audio-video system for the teacher, computers / laptops / tablets with audio-video system for each student, internet access, access to the Elearning UVT platform; Google Meets app.
5.2 for the seminar/laboratory	• complete fulfilment of tasks of laboratory work and projects • Computer / laptop with audio-video system for the teacher; computers / laptops / tablets with audio-

	video system for each student, internet access, access to the Elearning UVT platform; Google Meets application, eCognition, IDRISI and ENVI softwares.

6. Objectives of the discipline - expected learning outcomes to the formation of which contribute to the completion and promotion of the discipline

Knowledges	•Knowledge of concepts in Object-based Image Analysis (OBIA) •Understanding the advantages / disadvantages of satellite image analysis at pixel level respectively by OBIA •Knowledge of various image segmentation algorithms •Knowledge of rule-set based and region of interest classification methods •Knowledge of manual and (semi)automated objects delineation methods •Knowledge of the accuracy assessment methods in OBIA
Skils	• Hands-on skills in Definies Developer eCognition software • Developing an objective and analytical spirit in students; appreciating the advantages of each type of product or technique and understanding their complementarity; • Developing the ability of scientific analysis and communication in an academic environment
Responsibility and autonomy	• Applying efficient and responsible work strategies, based on the principles, norms and values of ethics in academic conduct; • Self-assessment of the need for continuous professional training in order to insert and adapt to the requirements of the labour market. • Applying efficient work techniques in a multidisciplinary team, ethical attitude towards the group, respect for diversity and multiculturalism; acceptance of diversity of opinion

7. Content

7.1 Lecture	**Teaching methods**	**Observations**
1. Human image perception and the classification of remote sensing data	Interactive presentations, heuristic conversation, problematization and hands-on examples	2 hours
2. Changing the paradigm: moving from pixel-based analysis to object-based analysis		2 hours
3. Hierarchical theory and its application in OBIA		2 hours
4. Generating objects by segmentation		4 hours
5. Segmentation techniques: based on pixel or histogram, based on region and limits identification		4 hours
6. Classification algorithms and modelling of classes		2 hours
7. Pixel-based classification techniques		2 hours
8. OBIA classification techniques		4 hours
9. Hierarchical classification of objects		2 hours
10. Using ancillary data in OBIA		2 hours
11. Accuracy assessments of the classification results in OBIA		2 hours

Bibliography

1. Baatz, M. Schäpe, M., (2000), Multiresolution segmentation — An optimization approach for high quality multi-scale image segmentation
2. Blaschke, T (2010), Object based image analysis for remote sensing, ISPRS Journal of Photogrammetry

and Remote Sensing,

3. Blaschke, T., Lang, S., Hay, G.J., (2008) Object-based image analysis, Spatial Concepts for knowledge-driven remote sensing applications, Lecture Notes in Geoinformation and Cartography;
4. Blaschke, T., Strobl, J., (2001), What's wrong with pixels? Some recent developments interfacing remote sensing and GIS, Interfacing Remote Sensing and GIS;
5. Neubert,M., Herold, H., Meinel, G., (2006) – Evaluation of remote sensing image segmentation quality – further results and concepts, Proceeginds of the 1st international Conference on Object-based Image Analysis, Salzburg, July 4-6;
6. Su Ye, Robert Gilmore Pontius, Rahul Rakshit, (2018), A review of accuracy assessment for object-based image analysis: From per-pixel to per-polygon approaches, ISPRS Journal of Photogrammetry and Remote Sensing,Volume 141, https://doi.org/10.1016/j.isprsjprs.2018.04.002.
7. Course presentations

References and course presentations are posted on Elearning UVT Platform (https://elearning.e-uvt.ro/)

7.2 Seminar / laboratory	Teaching methods	Observations
1. Introduction in eCognition software.	Hands-on exercises, case studies, scientific explanation and demonstration.	2 hours
2. Segmentation parameters in eCognition. Choosing the right segmentation scale using the Estimated Scale Parameter tool (ESP2).		2 hours
3. Image segmentation using segmentation algorithms implemented in eCogniton software.		4 hours
4. Analysis of object properties: geometric properties (size, shape), texture, hierarchical properties.		2 hours
5. Automatic classification of images based on samples		2 hours
6. Rule-set based automatic classification of the satellite images.		4 hours
7. Thematic classification based on multi-scale segmentation		2 hours
8. Change – detection in OBIA		2 hours
9. Visual and automatic delineation of objects using ArcGIS and Definiens.		2 hours
10. Other software that can be used to image segmentation and classification: ENVI and IDRISI		2 hours
11. Individual project / project assistance	Individual work, practical application, project presentation	The practical assignments are made individually by formulating problems that students will find solutions through OBIA.

Bibliography

Drăguţ, L., Csillik, O.,Eisank, C., Tiede, D., Automated parameterisation for multi-scale image segmentation on multiple layers,ISPRS Journal of Photogrammetry and Remote Sensing,Volume 88, https://doi.org/10.1016/j.isprsjprs.2013.11.018.
*** 2008, Definiens Developer Essential Training – Complete basic workflow, Definiens AG, Munchen.
*** 2018 Trimble eCognition Developer. Reference Book, Trimble Germany GmbH, 438 pp

The bibliography for the student's projects will be chosen individually, depending on their specific.

8. **Corroborating course content with the expectations held by the representatives of the epistemic community, professional associations and typical employers in the field of the study programme**

The content of the course was developed in accordance with the curriculum and meets the didactic and scientific requirements corresponding to similar specializations from other European universities. Course content will offer the students the necessary skills to start-up research projects leading to MSc Theses and to enroll in a PhD program. It stimulates the personal involvement of students in identifying problems that are suitable for image analysis in an OBIA environment. It facilitates the initiation by students of contacts and possible collaborations with companies and institutions in the field of GIS and remote sensing. The software used in practical applications is one of the most modern and frequently used in object – based image analysis.

9. **Assessment**

Type of activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final mark
10.4 Lecture	Understanding and assimilation of knowledge	Continuous evaluation	15%
	Course activity	Continuous evaluation	15%
10.5 Seminar / laboratory	Quality of the project and presentation.	Project presentation	70%
10.6 Minimum performance standard			
• Minimum mark 5 at course evaluation. • Minimum mark 5 at practical activities.			

Date
10.09.2023

Course convenor's signature

Date of approval in the department

Head of department's signature