SYLLABUS

1. Information about the study programme

1.1 Institution of higher education	West University of Timisoara
1.2 Faculty	Chemistry, Biology, Geography
1.3 Department of	Geography
1.4 Field of study	Geography
1.5 Study cycle	Master's degree
1.6 Study programme	Geographic Information Systems

2. Information about the subject/discipline

2.1 Name			**Digital cartography**				
2.2 Course coordinator			Conf. Univ. Dr. Dornik Andrei				
2.3 Seminar coordinator			Conf. Univ. Dr. Dornik Andrei				
2.4 Year of study	1	**2.5 Semester**	2	**2.6 Type of assessment**	E[1]	**2.7 Type of discipline**	DS/DOP

3. Total estimated time (hours of teaching per semester)[2]

3.1 Number of hours per week	**2**	**3.2 course**	**1**	**3.3 seminar/laboratory**	**1**
3.4 Total hours in the curriculum	**28**	**3.5 course**	**14**	**3.6 seminar/laboratory**	**14**
Distribution of time:					**hours**
Study based on Instructions, course materials, bibliography and notes					**30**
Additional documentation library, specialized electronic platforms / field					**30**
Training seminars / laboratories, homework, essays, portfolios and essays					**25**
Tutoring					**5**
Examinations[3]					**7**
Other activities					

3.7 Total hours of individual study	**90**
3.8 Total hours per semester[4]	**125**
3.9 Number of credits	**5**

[1] According to article 37, paragraph (1) of the Higher Education Law no. 199/2023, with subsequent amendments and additions, "the academic success of a student during a study program is determined by verifying the acquisition of the expected learning outcomes through exam-type evaluations and evaluation throughout the semester".
[2] The total number of contact hours and individual study hours will be aligned with the number of credits allocated to the course. One credit corresponds to a total between 25 and 30 hours of teaching activities and individual study. At the level of academic departments may establish, by discipline categories, the exact equivalence between one credit and the number of hours.
[3] The hours corresponding to examinations are added only to the point 3.8 – The total hours per semester, not to be added to the point 3.7 – Total hours of individual study.
[4] Total hours per semester = total hours in the curriculum + total hours of individual study + hours allocated to examinations.

4. Prerequisites (where applicable)

4.1 of curriculum	• Basics in programming; Geographic Information Systems; Geoinformatics
4.2 of skills	• Skills of computer use; analytical spirit; basics in Python programming language

5. Conditions (where applicable)

5.1 for the course	• Computer/laptop for the teacher and students • internet access; access to the Elearning UVT platform; video projector
5.2 for the laboratory	• complete fulfillment of tasks of laboratory work and projects • Computer/laptop for the teacher and students; • internet access; access to the Elearning UVT platform; video projector

6. Discipline objectives - expected learning outcomes which contribute to the completion and passing the discipline

Knowledge	• Understanding the concept of geospatial mapping and prediction • Understanding generalization and its role • Understanding the differences between traditional and digital (computer-based) mapping methods • Understanding the principle of environmental correlation • Knowledge of digital methods for land cover mapping, species distribution modelling, landslide susceptibility modelling • Knowledge of digital soil mapping methods based on soil forming factors (climate, organisms, relief, parental material) • Knowledge and understanding of how soil-forming factors can be represented digitally and used to create soil maps • Understanding the importance of assessing the accuracy of a product created through digital mapping
Skills	• Using methods and techniques for collecting and processing data from different sources, used for computer mapping • Applying various digital spatial prediction methods, for creating vegetation maps, soils, land cover, or other thematic maps • Creating graphic materials (cartodiagrams, maps) • Using ground truth data to assess the accuracy of a digital mapping product • Developing specialized studies and projects
Responsibility and autonomy	• Applying efficient and responsible work strategies, based on the principles, norms, and values of the code of professional ethics • Self-assessment of the need for the continuous professional training for insertion and adaptability to the requirements of the labor market • Using the computer to solve spatial problems and make decisions • Learning autonomy, initiative, and openness to lifelong learning • Raising students' awareness of their own capacity for scientific analysis and communication in an academic environment

7. Contents

The platform through which the course materials in electronic format and other learning/bibliographic resources can be accessed: elearning.uvt.ro

7.1 Course	Teaching methods	Comments
1. Basics of digital mapping (geospatial prediction)	Lecture, Interactive presentations, heuristic conversation, problematization and hands-on examples	1 hour
2. Data used for digital mapping. Calibration/ validation data		1 hour
3. Mapping methods. Differences between traditional and digital (computer-based) mapping methods		1 hour
4. Principle of environmental correlation		1 hour
5. Digital methods for land cover mapping		1 hour
6. Digital mapping methods in biogeography (species distribution modelling)		1 hour
7. Digital mapping methods for landslide susceptibility modelling		1 hour
8. Basics of soil mapping. Brief history of soil mapping		1 hour
9. Steps of a standard soil mapping approach. Traditional mapping vs. digital mapping		1 hour
10. Digital soil mapping. Conceptualization of soil characteristics (properties or classes). Map scale		1 hour
11. Digital soil mapping. Identification, acquisition, and derivation of input data. Environmental variables as soil forming factors		1 hour
12. Digital soil mapping methods: interpolation, classification, machine learning, deep learning, expert-based methods		1 hour
13. Evaluating the accuracy of a geospatial prediction: root mean square error, overall accuracy, Kappa index		1 hour
14. Evaluation, Feedback		1 hour

Bibliography:

- Joseph L. Awange, John B. Kyalo Kiema, 2013, Environmental Geoinformatics - Monitoring and Management, Springer
- Dornik, A., et al. (2018). Classification of soil types using geographic object-based image analysis and random forests. Pedosphere 28(6): 913-925.
- Dornik, A., et al. (2016). Knowledge-based soil type classification using terrain segmentation. Soil Research 54(7): 809-823.
- Diaz-Gonzalez, F. A., et al. (2022). Machine learning and remote sensing techniques applied to estimate soil indicators–review. Ecological Indicators 135: 108517.
- Mcbratney, A., Mendonca Santos, M. L., Minasny, B., 2003, On digital soil mapping, Geoderma, 117, 3-52.
- Lagacherie, A. B. Mcbratney, M. Voltz, 2006, Digital Soil Mapping An Introductory Perspective, Elsevier, pp. 353-617
- Ben-Dor, E., Chabrillat, S., Demattê, J., Taylor, G., Hill, J., Whiting, M., Sommer, S., 2009, Using imaging spectroscopy to study soil properties, Remote Sensing of Environment, 113, S38-S55.
- Dornik, A., et al. (2021). Soil-related predictors for distribution modelling of four European crayfish species. Water 13(16): 2280.
- Janet Franklin, 1995, Predictive vegetation mapping: geographic modelling of biospatial patterns in relation to environmental gradients, Progress in Physical Geography
- Kraak M-J, Ormeling F (2010) Cartography. Visualization of Spatial Data, Pearson, 249 p;
- Krygier, J, Wood D (2011) Making maps: a visual guide to map design for GIS, The Guilford Press, New York, 280 p;
- References and presentations made available on Elearning UVT Platform (https://elearning.e-uvt.ro)

7.2. Laboratory	Teaching methods	Comments
1. Basics of digital mapping (geospatial prediction)	Hands-on exercises, case studies, scientific explanation and demonstration.	1 hour
2. Data used for digital mapping. Calibration/ validation data		1 hour
3. Mapping methods. Differences between traditional and digital (computer-based) mapping methods		1 hour
4. Principle of environmental correlation		1 hour
5. Digital methods for land cover mapping		1 hour
6. Digital mapping methods in biogeography (species distribution modelling)		1 hour
7. Digital mapping methods for landslide susceptibility modelling		1 hour
8. Basics of soil mapping. Brief history of soil mapping		1 hour
9. Steps of a standard soil mapping approach. Traditional mapping vs. digital mapping		1 hour
10. Digital soil mapping. Conceptualization of soil characteristics (properties or classes). Map scale		1 hour
11. Digital soil mapping. Identification, acquisition, and derivation of input data. Environmental variables as soil forming factors		1 hour
12. Digital soil mapping methods: interpolation, classification, machine learning, deep learning, expert-based methods		1 hour
13. Evaluating the accuracy of a geospatial prediction: root mean square error, overall accuracy, Kappa index		1 hour
14. Evaluation, Feedback		1 hour

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8. Corroboration of the course contents with the epistemic expectations of the community representative, professional associations and representative employers of the programme itself

The discipline's content was developed according to the curriculum and meets the didactic and scientific requirements corresponding to similar specializations in other university centers. Digital cartography facilitates the acquisition of basic knowledge in carrying out a research project, both from a theoretical point of view and from the point of view of working methods in the field, developing students' analytical thinking, the ability to problematize, to manage a scientific approach, of a database and its operation. The practical applications' software is among the most modern and frequently used in specialized institutions. Such applied training makes students compatible with the job market in geographic information systems, or research activity.

9. Use of tools based on generative artificial intelligence

To complete the tasks defined in the assessment section, only for laboratory, the use of generative AII tools is permitted for generating ideas/slogans/designs/images/text rewriting, editing/reviewing. The most well-known examples of generative AII tools include, but are not limited to: ChatGPT, Google Gemini, Copilot for text, or MidJourney for images.
Each student will specify, in a statement written separately for each assignment, according to the model in Annex 3 of the Regulation on the use of generative artificial intelligence in the educational process at UVT, the tool they used, how it was used, and the part of the assignment in which it was used. The statement will be included by the student at the beginning of the submitted assignment.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final mark
10.4 Course	Understanding and assimilation of knowledge	Oral evaluation	20 %
10.5 Laboratory	Individual project demonstrating the understanding and assimilation of practical skills (methods)	Continuous formative evaluation: Project developed during the semester, with the results obtained in laboratory activities integrated into short tutorials and interpretations. The project is uploaded to the e-learning platform.	80 %

10.6 Minimum performance standards

- Promotion of the course and laboratory with a minimum grade of 5 for each of these, according to the grading scales displayed during the examination.
- The assessment (practical and theoretical) is mandatory.
- No projects are permitted after the deadline has passed.
- Additionally, if deemed necessary, the teacher may supplement the examination with an oral assessment, as appropriate.
- According to the regulations, the same criteria also apply in the re-evaluation session.

Date of submission:
28.01.2026

Titular of the course: Conf. Dr. Andrei Dornik
Signature:

Date of approval in department:

Seminary titular: Conf. Dr. Andrei Dornik
Signature:

HEAD OF THE DEPARTMENT: Conf. dr. Ioan Sebastian Jucu