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			**Geovisualization**				
2.2 Course coordinator			Dr. Mircea Ardelean				
2.3 Seminar coordinator			Dr. Mircea Ardelean				
2.4 Year of study	I	**2.5 Semester**	II	**2.6 Type of assessment**	E[1]	**2.7 Type of discipline**	DO

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

3.1 Number of hours per week	**4**	**3.2 course**	**2**	**3.3 seminar/laboratory**	**2**
3.4 Total hours in the curriculum	**56**	**3.5 course**	**28**	**3.6 seminar/laboratory**	**28**
Distribution of time:					**hours**
Study based on Instructions, course materials, bibliography and notes					**20**
Additional documentation library, specialized electronic platforms / field					**12**
Training seminars / laboratories, homework, essays, portfolios and essays					**24**
Tutoring					**8**
Examinations[3]					**5**
Other activities					**-**

3.7 Total hours of individual study	**64**
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 knowledge in Cartography and Geographic Information Systems
4.2 of skills	Basics knowledge in Cartography and Geographic Information Systems

5. Conditions (where applicable)

5.1 for the course	computer, whiteboard, video-projector, specific software
5.2 for the seminar	computer, whiteboard, video-projector, specific software

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

Knowledge	K 1 - Knowledge of concepts in geovisualization K 2 - Understanding the differences between statistics and spatial statistics K 3 - Theoretical knowledge and techniques on exploratory data analysis K 4 - Theoretical knowledge and techniques on exploratory spatial data analysis K 5 - Knowledge on different methods and techniques on symbolization and their perceived outcome K 6 - Understanding the role of *time* in spatial data analysis K 7 - Identification of potential directions for continuing research in areas of theoretical or practical relevance
Skills	S 1 - Adequately apply the symbolization (colors, categories, classes, visual hierarchy) in conveying the message S 2 - Efficiently perform data exploration in discovering causality between variables S 3 - Use of AI in enhancing and optimizing the data exploration S 4 - Understand the role of models and sensitivity analysis with regard at the outcome S 5 - Integrate the dynamics by using time in spatial analysis and representations S 6 - Integrate real data into virtual spatial models and assigning them interactivity
Responsibility and autonomy	RA 1 - Understanding of ethics in academic conduct (correct citations, avoiding plagiarism, avoiding fabrication) RA 2 - Developing team working abilities RA 3 - Self-assessment of the continuous professional training need for the purpose of integration and adaptability to the labor market requirements RA 4 - Establishing potential connections for interdisciplinary development

7. Contents

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

7.1 Course	**Teaching methods**	**Comments**
1. Geovisualization: general framework (what, why & how?) K1, K2	Lectures combined interactively with hands-on exercises.	
2. Symbolization, typography, visual hierarchy K3, K5		

3. Use of color. Cartograms K5		
4. Data classification K2, K3, K4		4 hours
5. Mapping time K5, K6		4 hours
6. Interpolation methods and their visualization K2		4 hours
7. Augmented & enhanced reality K3, K5, K7		
8. 3D representation of relief K3, K4		
9. Exploratory Data Analysis – statistical maps K2, K3, K7		4 hours
10. Exploratory Spatial Data Analysis – spatial error K2, K3, K4, K5, K7		

Bibliography:

1. **Anselin, L. (1995)** ***Local Indicators of Spatial Association—LISA***. Geographical Analysis
2. **Anselin L.** (2003) ***GeoDA 0.9 User's guide***
3. **Anselin L.** (2005) ***Exploring Spatial Data with GeoDA***
4. **Dodge, S., & Kounadi, O.** (2024) ***Geovisual Analytics and Artificial Intelligence in Smart City Development***. Springer
5. **Dykes J., MacEarchen A.M., Kraak M-J (**2005) ***Exploring geovisualization***, Elsevier
6. **Koussoulakou, A.** (2019) ***Spatio-Temporal Geovisualization: Principles, Data, and Applications***. CRC Press
7. **Kraak, M.J.** (2003) ***Geovisualization illustrated***, *J. of Photogrammetry & Remote Sensing*, **57**, 390-399
8. **Kraak, M. J., & Ormeling, F. J.** (Ediții variate) ***Cartography: Visualization of Spatial Data***. Taylor & Francis
9. **Longley, P.A., Goodchild, M.F., Maguire, D.J., Rhind, D.W.** (2005) ***Geographical Information Systems and Science***, John Wiley & Sons, Chichester, England
10. **MacEachren, A. M., & Kraak, M. J. (**1997) ***Exploratory Cartographic Visualization: Advancing the Agenda***. Computers & Geosciences
11. **Monmonier M. (**1996) ***How to Lie with Maps***, The University of Chicago Press
12. **Robinson, A. C., O'Brien, L. J., Roth, R. E., & Griffin, P. J. G. D.** (2017) ***Cartography and Geovisualization***. In: The Geographic Information Science & Technology Body of Knowledge (GIS&T BoK)
13. **Slokum T.A., Mc.Master R.B., Kessler F.C., Howard H.H.** (2009) ***Thematic cartography and Geographic Visualization***, Prentice Hall

7.2. Seminar	**Teaching methods**	**Comments**
1. How not to lie with maps? - elementary statistics for spatial data representation S3	Hands-on exercises.	
2. Symbolization, typography, visual hierarchy S1		4 hours
3. Symbolization, use of color S1		4 hours
4. Data classification S2		4 hours
5. Time animation in spatial data exploration S5		6 hours
6. Visualization of results from interpolation S4		6 hours
7. 3d visualisation on Google Earth S6		

Bibliography:

Literature will be selected individually, according to research interests of the students.

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

This course will offer the theoretical framework and specific hands-on abilities for large spatial data-sets manipulation and assessment. Geovisualization techniques are necessary skills to start-up scientific projects, MSc Theses and/or PhD programs.

9. Use of tools based on generative artificial intelligence

The use of generative artificial intelligence (GAI) is permitted and encouraged for exploring ideas and designs and for code generation provided that usage and source is properly acknowledged. The acknowledgement should include which part of the work is done by using GAI. GAI should be used in the phase of documentation and for synthesis of novel ideas. To expand and explore theoretical concepts GAI may be used to complement the lectures delivered but the student is expected to seamlessly integrate the GAI inputs with the concepts exposed in the lectures. GAI may also be used to enhance the knowledge and skills necessary for a better and more comprehensive performance of the laboratory works, especially when dealing with transdisciplinary subjects and approaches. Full works (reports, essays, presentations, maps or entire projects) generated or created only by using GAI are not acceptable and would be rejected.

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	The degree of understanding and mastery of theoretical concepts	written or oral examination	50 %
10.5 Seminar	The degree to which students are able to conduct an exploratory spatial data analysis.	project evaluation	50 %
10.6 Minimum performance standards			
• obtaining a grade of 5 in the final evaluation both in course and seminar activity; • at least 75% attendance in seminars; • submission of all mandatory assignments in due time and under the specified conditions; • passing all practical activities; • proper mentioning of the usage of generative artificial intelligence in Annex 3.			

Date of submission:
28 / 01 / 2026

Titular of the course & seminar:
Lect. dr. Mircea Ardelean
Signature:

Date of approval in department:

HEAD OF THE DEPARTMENT: