COURSE OUTLINE

1. Study programme information

1.1 Higher education institution	Universitatea de Vest din Timişoara
1.2 Faculty / Department	Chimie-Biologie-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			Spatial analysis and modelling in GIS				
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	I	2.5 Semester	II	2.6 Type of assessment	E	2.7 Course type	DF/DOB

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

3.1 Number of hours per week	4	of which: 3.2 lecture	1	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	42	of which: 3.5 lecture	14	3.6 seminar/laboratory	28

Time distribution:	**hours**
Studying textbooks, course materials, bibliography and notes	16
Further research in libraries, on electronic platforms and in the field	22
Preparing seminars/ laboratories, homework, research papers, portfolios and essays	25
Tutoring	10
Examinations	10
Other activities	

3.7 Total hours of individual study	**73**
3.8 Total hours per semester	**125**
3.9 Number of credits	**5**

4. Prerequisites (if applicable)

4.1 based on curriculum	• GIS, Remote Sensing
4.2 based on competencies	• Basic knowledges in GIS and Remote Sensing

5. Conditions (if applicable)

5.1 for the course	• at least 50% attendance at course activities. • Computer / laptop for the teacher, computers / laptops / tablets for each student, internet access, access to the eLearning UVT platform • Google Meet will be used for the online activity. • 30% of the courses will be taught online
5.2 for the laboratory	• attendance is mandatory • complete fulfilment of tasks of laboratory work and projects • Computer with audio / video system and internet connection, GIS softwares (TerrSet, ArcgGIS Pro, ArcGIS Online). • The support materials/tutorials, the data used for the practical works and the references will be accessible on the eLearning UVT platform • Google Meet will be used for the online activity. • 30% of the practical activities will be taught online

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 Spatial Analysis • Students are able to choose and apply appropriate methods of spatial analysis in order to successfully solve geographical problems • Knowledge of concepts in and Spatial Analysis GIS modeling • Knowledge of Spatial Analysis methods • Knowledge of GIS modeling methods and algorithms • Correlative analysis of variation and dynamics of territorial components and processes using GIS techniques.
Skils	• Hands-on skills in Spatial Analyisis in various softwares • 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. Contents

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

7.1 Lecture	Teaching methods	Observations
1. Introduction in Spatial Analysis.	Interactive presentations, heuristic conversation, problematization and hands-on examples	*** Course material posted on the elearning UVT platform Longley. P. A., Goodchild, M.F., Maguire, D.J., Rhind, D.W. (2010), Geographic Information Systems and Science, Edit. John Wiley & Sons. Stillwell, J., Clarke, G.,. 2004, Applied GIS and Spatial Analysis, Edit John Wiley &Sons.
2. Spatial analysis of point data: spatial density analysis, spatial analysis of areas of influence		*** Course material posted on the elearning UVT platform Fischer, M., Getis, A., 2010, Handbook of Applied Spatial Analysis - Software Tools, Methods and Applications, Springer
3. Logical operators and Boolean analysis		*** Course material posted on the elearning UVT platform Eastman J., R., (2020) – TerrSet2020 Manual. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts. Stillwell, J., Clarke, G.,. 2004, Applied GIS and Spatial Analysis, Edit John Wiley &Sons.
4. Using fuzzy membership family functions for standardizing geo-spatial data.		*** Course material posted on the elearning UVT platform Eastman J., R., (2020) – TerrSet2020 Manual. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts.
5. GIS as a decision support system: Multi Criteria Evaluation		*** Course material posted on the elearning UVT platform Eastman J., R., (2020) – TerrSet2020 Manual. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts. Stillwell, J., Clarke, G.,. 2004, Applied GIS and Spatial Analysis, Edit John Wiley &Sons.
6. Raster and vector distance operators in GIS		*** Course material posted on the elearning UVT platform Longley. P. A., Goodchild, M.F., Maguire, D.J., Rhind, D.W. (2006), Geographic Information Systems and Science, Edit. John Wiley & Sons. Eastman J., R., (2020) – TerrSet2020 Manual. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts.
7. Spatial and spatio-temporal modeling methods in GIS		*** Course material posted on the elearning UVT platform Eastman J., R., (2020) – TerrSet2020 Manual. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography Longley. P. A., Goodchild, M.F., Maguire, D.J., Rhind, D.W. (2010), Geographic Information Systems and Science, Edit. John Wiley & Sons., Worcester, Masachusetts.

Bibliography

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;
Briassoulis, H., Kavroudakis, D., Soulakellis, N., (2019), The Practice of Spatial Analysis, Springer.
Eastman J., R., (2020) – TerrSet2020 Manual. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts.
Gao, J. (2022). Fundamentals of Spatial Analysis and Modelling. Taylor & Francis Group, 369 pp.
Longley, P.A., Goodchild, M., Maguire, D.J., Rhind, D.W. (2010)- *Geographic Information Systems and Science*, John Wiley & Sons, 560 pp.
Fischer, M., Getis, A., 2010, Handbook of Applied Spatial Analysis - Software Tools, Methods and Applications, Springer.
Stillwell, J., Clarke, G. 2004, Applied GIS and Spatial Analysis, Edit John Wiley &Sons.
*** Course presentations posted on the eLearning UVT platform

7.2 Seminar / laboratory	Teaching methods	Observations
1. Analysis of the spatial distribution of point data (ArcGIS)	Hands-on exercises, case studies, scientific explanation and demonstration.	McCoy, J., (2008), Geoprocessing in ArcGIS, ESRI, Redlands. Gorr W. L. and Kurland K.S. 2021. Gis Tutorial for Arcgis Pro 2.8. Redlands California: Esri Press *** Laboratory tutorials and data posted on the UVT elearning platform
2. Using fuzzy membership family functions for standardizing geo-spatial data in TerrSet software		Eastman J., R., (2020) – TerrSet2020 Tutorial. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts. *** Laboratory tutorials and data posted on the UVT elearning platform
3. Multicriteria evaluation in TerrSet and ArcGIS		Eastman J., R., (2020) – TerrSet2020 Tutorial. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts. McCoy, J., (2008), Geoprocessing in ArcGIS, ESRI, Redlands. Gorr W. L. and Kurland K.S. 2021. Gis Tutorial for Arcgis Pro 2.8. Redlands California: Esri Press *** Laboratory tutorials and data posted on the UVT elearning platform
4. Distance operators in TerrSet and ArcGIS		Eastman J., R., (2020) – TerrSet2020 Tutorial. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts. McCoy, J., (2008), Geoprocessing in ArcGIS, ESRI, Redlands. *** Laboratory tutorials and data posted on the UVT elearning platform
5. Modeling stochastic phenomena using Markov chains (TerrSet software).		Eastman J., R., (2020) – TerrSet2020 Tutorial. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts. *** Laboratory tutorials and data posted on the UVT elearning platform
6. Time series analysis in TerrSet software		Eastman J., R., (2020) – TerrSet2020 Tutorial. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts.

		*** Laboratory tutorials and data posted on the UVT elearning platform
7. Land Change Modeller for spatio-temporal changes analysis		Eastman J., R., (2020) – TerrSet2020 Tutorial. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts. *** Laboratory tutorials and data posted on the UVT elearning platform
8. Building models with Macro Modeler (TerrSet) and Model Builder (ArcGIS); various applications.		Eastman J., R., (2020) – TerrSet2020 Tutorial. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts. Gorr W. L. and Kurland K.S. 2021. Gis Tutorial for Arcgis Pro 2.8. Redlands California: Esri Press *** Laboratory tutorials and data posted on the UVT elearning platform
9. 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 spatial analysis.

Bibliography

Eastman J., R., (2020) – TerrSet2020 Tutorial. Geospatial Monitoring and Modeling System, Clark University, Graduate School of Geography, Worcester, Masachusetts.
Gorr W. L. and Kurland K.S. 2021. Gis Tutorial for Arcgis Pro 2.8. Redlands California: Esri Press.
McCoy, J. 2008. Geoprocessing in ArcGIS. ESRI Redlans USA, 363 pp.

*** Laboratory tutorials and data posted on the UVT elearning platform

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 course content complies with the curriculum and meets the didactic and scientific standards of comparable programs at other universities. It equips students with the skills required to initiate research projects leading to MSc theses and further doctoral studies. The course stimulates students' active engagement in identifying problems suitable for spatial analysis and GIS-based modelling, while also supporting the development of contacts and potential collaborations with companies and institutions in the GIS sector. Practical activities rely on some of the most modern and widely used software in specialized institutions.

9. Use of generative artificial intelligence tools

For completing the tasks defined in the assessment section the use of GenAI tools is permitted only for generating text rewriting, editing and review, only to the laboratory. *The most well-known examples of GenAI tools include, but are not limited to: ChatGPT, Google Gemini, Copilot for text, or MidJourney for images.* *Each student must specify, in a declaration drafted separately for each assignment, in accordance with the model provided in Annex 3 of the Regulation on the Use of Generative Artificial Intelligence in the Educational Process at UVT, the tool used, how it was used, and the part of the assignment in which it was used. The declaration must be indicated by the student at the beginning of the completed assignment.*

10. Assessment

Type of activity	8.1 Assessment criteria	8.2 Assessment methods	8.3 Weight in the final mark
8.4 Lecture	Course activity	Continuous evaluation	10%
8.5 Seminar / laboratory	Assessment of practical tasks during the semester	Practical tasks evaluation	20%
	Quality of the project and presentation. The degree to which students are able to conduct a spatial analysis approach.	Project evaluation	70%
8.6 Minimum performance standard			
• Minimum mark 5 at course evaluation. • Minimum mark 5 at practical activities.			

Date
27.01.2026

Course convenor's signature

Date of approval in the department

Head of department's signature
Lector univ. dr. Ioan-Sebastian JUCU