

## SYLLABUS

### 1. Information about the program

1.1 Institution of higher education	„Babeş-Bolyai” University, Cluj-Napoca
1.2 Faculty	Geography
1.3 Department	Doctoral School of Geography
1.4 Study area	Geography
1.5 Level of study	Doctoral studies
1.6 Program of study	Doctoral School of Geography

### 2. Information about the course

2.1 Title of the course	<b>SPATIAL STATISTICS IN GIS</b>						
2.2 Course taught by:	Dr. Titus MAN, Associate Professor						
2.3 Seminar by:	Dr. Titus MAN, Associate Professor						
2.4 Year of study	<b>I</b>	2.5 Semester	<b>II</b>	2.6 Method of assessment	<b>E</b>	2.7 Type of course	<b>RQ</b>

### 3. Time allocation (hours per semester of pedagogical activities)

3.1 Hours per week	3	of which: 3.2 course	2	3.3 seminar	1
3.4 Total hours – semester	42	of which: 3.5 course	28	3.6 seminar	14
Time allocation					hours
Study for exams					30
Additional documentation in the library, on the internet and in the field and working on the semester project and presentation					40
Reading for the seminar and writing the projects					50
Tutoring					9
Exam					1
Other activities					10
3.7 Total hours for individual study	139				
<b>3.8 Total hours per semester</b>	<b>175</b>				
3.9 Number of credits	7				

### 4. Prerequisites (if any)

4.1 curriculum-related	-
4.2 competence-related	-

## 5. Other requirements (if any)

5.1 for the course	<ul style="list-style-type: none"> <li>Classroom with desktop/laptop, projector and power point software, access to internet.</li> </ul>
5.2 for the seminar	<ul style="list-style-type: none"> <li>Computer room, Internet connection</li> </ul>

## 6. Competencies

<b>Generic competencies</b>	<ul style="list-style-type: none"> <li>C1 Ability to solve problems.</li> <li>C2 Ability to organize and plan ahead.</li> <li>C3 Ability to analyze, synthesize, interpret and communicate information.</li> <li>C4 Ability to create new ideas</li> </ul>
<b>Specific competencies</b>	<ul style="list-style-type: none"> <li>CT 1 The PhD student will be able to work with information resources in geospatial analysis.</li> <li>CT 2 The PhD student will be able to use and describe the tools used to manage databases.</li> <li>CT 3 The PhD student will be able to apply the gained knowledge in practice.</li> </ul>

## 7. Course objectives

7.1 General goals	<ul style="list-style-type: none"> <li>To address the full spectrum of statistical and spatial analysis and associated modeling techniques that are provided within currently available and widely used geographic information systems (GIS) and associated software</li> </ul>
7.2 Specific objectives	<ul style="list-style-type: none"> <li>Students will be able to address the central issues and problems associated with data that need to be considered in any analytical exercise</li> <li>Students will gain understanding of the methodological background of statistical analysis</li> <li>Students will extend their understanding of more specialized tools, designed to address the needs of specific sectors or technical problems that are otherwise not well-supported within the core statistical and GIS packages at present</li> </ul>

## 8. Outline

8.1 Course	Teaching method(s)	Observations
1. Statistical Concepts in Geography	<ul style="list-style-type: none"> <li>lecturing</li> </ul>	2 hours
2. Spatial measurements and statistics	<ul style="list-style-type: none"> <li>lecturing</li> </ul>	2 hours
3. Geographic distributions	<ul style="list-style-type: none"> <li>lecturing</li> </ul>	4 hours
4. Identifying patterns	<ul style="list-style-type: none"> <li></li> </ul>	4 hours
5. Spatial Statistics: Point Pattern analysis, Area pattern analysis	<ul style="list-style-type: none"> <li>lecturing</li> </ul>	4 hours
6. Analyzing geographic relationships	<ul style="list-style-type: none"> <li>lecturing</li> </ul>	4 hours
7. Statistical Relationships Between Variables: Correlation, Linear and Multiple Regressions	<ul style="list-style-type: none"> <li>lecturing</li> </ul>	4 hours

8. Data analytics and Geovisualization	• lecturing	2 hours
9. Modeling paths, flows and interactions in GIS	• lecturing	2 hours
<b>8.2 Seminar</b>	<b>Teaching method(s)</b>	<b>Observations</b>
1. Spatial analysis, GIS, software tools	• Instructor-led seminar	2 hours
2. Conceptual frameworks for statistical and spatial analysis: spatial statistics, spatial data infrastructure	• Instructor-led seminar	2 hours
3. Spatial Analysis I: Spatial and Spatio-temporal Data Models and Methods, Geometric and Related Operations, Queries, Computations and Density	• Instructor-led seminar	3 hours
4. Data Exploration and Spatial Statistics I: Statistical Methods and Spatial Data, Exploratory Spatial Data Analysis, Grid-based Statistics and Metrics	• Instructor-led seminar	3 hours
5. Data Exploration and Spatial Statistics II: Point Sets and Distance Statistics, Spatial Autocorrelation, Spatial Regression	• Instructor-led seminar	2 hours
6. Surface and Field Analysis: Geostatistical Interpolation Methods	• Instructor-led seminar	2 hours

## 9. Bibliography

1. Allen, D., W. (2016), GIS Tutorial 2: Spatial Analysis Workbook, ESRI Press
2. Allen, D., W., Coffey, J., M. (2010), GIS Tutorial 3: Advanced Workbook, ESRI Press
3. Bavaud, F., Mager, C. (Eds)(2009), Handbook of Theoretical and Quantitative Geography, UNIL, FGSE Workshop series no 2.
4. de Smith, M., J., Goodchild, M., F., Longley, P., A. (2015), Geospatial Analysis. A Comprehensive Guide to Principles, Techniques and Software Tools, The Winchelsea Press, Winchelsea, UK, 750p
5. Docan, Daniela (2016), Learning ArcGIS for Desktop, Packt Publishing, 331p
6. Gomarasca, M., A. (2009), Basics of Geomatics, Springer Netherlands, 656p
7. Gorr, W., L., Kurland, Kristen (2016), GIS Tutorial 1: Basic Workbook, 10.3.x edition, ESRI Press
8. Graser, Anita, Mearns, B., Mandel, A., Ferrero, V., O., Bruy, A. (2017), QGIS. Becoming a GIS Power User, Packt, 727p
9. Kennedy, M., D., Goodchild, M., F., Dangermond, J. (2013), Introducing Geographic Information Systems with ArcGIS: A Workbook Approach to Learning GIS [3 ed.], Wiley, 672p
10. Liu, J., G., Mason, Philippa (2016), Image Processing and GIS for Remote Sensing: Techniques and Applications [2ed.], Wiley Blackwell, 472p
11. Longley, P., A., Goodchild, M., F., Maguire, D., J., Rhind, D., W. (2010), Geographic information systems and science. 3rd ed., J Wiley, Chichester, UK
12. Matthews, J. A. (1981), Quantitative and Statistical Approaches to Geography. A practical manual. Pergamon Press.
13. Mitchell, A. (2001), The ESRI Guide to GIS Analysis, Volume 1: Geographic Patterns and Relationships, ESRI Press
14. Mitchell, A. (2005), The ESRI Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics, ESRI Press
15. Mitchell, A. (2012), The Esri Guide to GIS Analysis, Volume 3: Modeling Suitability, Movement, and Interaction, ESRI Press

16. Wang, F. (2014), Quantitative Methods and Socio-Economic Applications in GIS [2 ed.], CRC Press, 333p  
 17. Walford, N. (2011), Practical Statistics for Geographers and Earth Scientists, Wiley-Blackwell.

### 10. Assessment and evaluation

Type of activity	10.1 Criteria for assessment	10.2 Method of assessment	10.3 Percent of final grade
11.1 Course	To be announced	Final exam	35%
		Final project and its presentation	35%
11.2 Seminar	To be announced	Individual projects (2)	20%
		Attendance and active participation	10%

Date                      Signature course lecturer                      Signature seminar instructor  
 28.09.2022              Dr. Titus MAN, Associate Professor              Dr. Titus MAN, Associate Professor

Date departmental approval                      Signature department chair  
 30.09.2022                      Prof. dr. József Benedek