

Academic Year: 2017/2018		
<b>Course: Spatial Analysis and GIS</b>		
<b>Coordinator: Eusébio Reis</b>		
<b>Teaching Staff: Eusébio Reis</b>		
<b>ECTS: 6</b>	<b>Weekly Hours: 4h</b>	<b>Typology: Theoretical/Practical</b>
Contents		
<p><b>1. INTRODUCTION TO SPATIAL ANALYSIS</b></p> <p>1.1. Types of analytical functions in GIS</p> <p>1.2. Spatial data in adequability and susceptibility assessment</p> <p>1.3. Cartographic Modelling</p> <p><b>2. QUANTITATIVE RELATIONSHIP BETWEEN GEOGRAPHICAL DATA</b></p> <p>2.1. Querying and overlay in raster environment</p> <p>2.1.1. Arithmetical, logical and relational operators.</p> <p>2.1.2. Conditional functions.</p> <p>2.2. Calculation of the relationship between spatial variables</p> <p>2.2.1. Association between variables (quantitative and qualitative).</p> <p>2.2.2. Initial and conditional spatial probabilities.</p> <p>2.2.3. Simple and multiple Linear Regression in GIS.</p> <p><b>3. MULTICRITERIA ANALYSIS (MCA)</b></p> <p>3.1. Boolean analysis and weighted analysis of factors</p> <p>3.2. Methods for factor weighting and value scaling</p> <p>3.2.1. Role of decision-makers and scientific consultants.</p> <p>3.2.2. The use of conditional probability.</p> <p>3.3. Spatial integration using Weighted Linear Combination (WLC)</p> <p>3.4. Spatial integration using Analytical Hierarchy Process (AHP)</p> <p><b>4. NEIGHBOURHOOD AND CONNECTIVITY OPERATIONS</b></p> <p>4.1. Neighborhood (or proximity) operations</p> <p>4.1.1. General characteristics: differences between the processes in vector and raster data structures.</p> <p>4.1.2. The importance of the iteration process in neighborhood operations.</p> <p>4.2. Connectivity operations</p> <p>4.2.1. Types of connectivity operations. Connectivity operations on vector and raster data structures: differences and adaptation to different types of studies.</p> <p>4.2.2. Isotropic and anisotropic surfaces. Use of friction variables.</p> <p>4.2.3. Obtaining distances and cost-optimal paths.</p>		
Objectives and skills		
<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>- Explore data structures for analyzing spatial problems</li> <li>- Develop methodologies for spatial analysis</li> <li>- Apply spatial analysis procedures on technological platforms</li> </ul> <p><b>Skills:</b></p> <ul style="list-style-type: none"> <li>- Acquire the ability to manipulate and integrate spatial data.</li> <li>- Understand the concepts inherent to spatial analysis and modeling in a GIS</li> <li>- To develop skills in data modeling.</li> <li>- Understand the principles of algorithms based on spatial analysis operators.</li> <li>- Implement spatial analysis in a GIS environment.</li> </ul>		

### References

- Fotheringham S, Rogerson P (Eds) 2005 *Spatial analysis and GIS. Technical Issues in Geographic Information Systems*. Taylor & Francis. 172 p.
- Haining R 2004 *Spatial Data Analysis: Theory and Practice*. Cambridge University Press. 432 p.
- Kelly R, Drake N, Barr S (Eds.) 2004 *Spatial Modelling of the Terrestrial Environment*. John Wiley & Sons, Chichester. 276 p.
- Sanders L (Ed.) 2007 *Models in Spatial Analysis. Geographical Information System Series*. ISTE. 319 p.
- Stillwell J, Clarke G (Eds) 2004 *Applied GIS and Spatial Analysis*. John Wiley & Sons, Chichester, England. 406 p.
- Verbyla, D L 2002 *Practical GIS Analysis*. Taylor & Francis, London and New York, 294 p.

### Knowledge evaluation methods and their partial grades

The normal student evaluation includes the next four elements:

- two practical group work (2 students) - 25% + 30% of the final grade;
- one theoretical and practical exercise - 40% of the final grade;
- personal evaluation of the student (5% of the final grade), based on assiduity, participation, class performance and evolution along the course.

The special student evaluation includes the next two elements:

- one practical individual work (50% of the final grade);
- one theoretical and practical exercise (50% of the final grade).