Subject Description Form

Subject Code	LSGI4244
Subject Title	**Spatial Big Data Analytics**
Credit Value	3
Level	4
Pre-requisite	LSGI2223 Geographic Information Science
Objectives	1. To develop students' understanding on what geospatial data mining and knowledge discovery are. 2. To enable students learn the methods of spatial data mining including classification, clustering analysis, association rules analysis. 3. To enable students critically review data mining and knowledge discovery problems through case studies.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. Explain the purpose of spatial data mining (L3) 2. Describe a range of data mining methods and their use in analyzing geographic data (L2) 3. Identify and select the appropriate methods for mining knowledge from geo-spatial data (L3) 4. Analyze geo-spatial data and construct models (L3) 5. Test models through validation and able to criticize their reliability (L4)
Subject Synopsis/ Indicative Syllabus	Spatial big data analytics • Introduction of big data and spatial big data • Big data preprocessing o Data cleaning, normalization, and integration o Noise identification • Exploratory Spatial data analysis and visualization • Descriptive and Regression o Descriptive statistics for spatial data o Geographically weighted regression • Point data pattern analysis o Quadrat estimation o K functions • Line data pattern and network analysis o Line features o Network connectivity and path algorithm • Area data pattern and spatial autocorrelation o Joint count o Moran’s I and Geary’s C

<table>
<tr><td></td><td>• Spatial interpolation and surface analysis
o IDW, Tessellation, Spline
o Kriging (simple and ordinary)
• Stream data and time-series analysis
o Smooth
o Decomposition
o Modeling</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. Lectures to explain theories and methodology;
2. Lab sessions and a small individual project to reinforce the theories and methodology introduced during the lectures, so as to enable students to gain deeper understanding of the principles and techniques, to acquire practical problem-solving skills, to become critical in thinking; and
3. A group project is designed to enhance the critical thinking, team spirit, problem solving skill, leadership and presentation skill.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>1. Class exercises</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Lab practices</td><td>30%</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Written test</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

It consists of 100% continuous assessment through class exercises (30%), lab practice (30%), and written test (40%). Class exercises include in-class Q & A activities, student presentation, and assignments. Lab practice includes lab and tutorial. Through these activities, students will be assessed about the fundamental knowledge in spatial data mining and the practical capabilities of performing spatial data mining using actual data sets. Problem based learning is carried out during the Q & A and tutorials, and is reinforced by assignments. Presentation and lab contribute to the all round development of students. Written test is designed to monitor student learning at knowledge level. Students are expected to achieve a minimum standard to be able to obtain a passing grade in line with criterion referenced assessment approach.</td></tr>
<tr><td>Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td></td><td>▪ Lecture</td><td>26 Hrs.</td></tr>
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	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Reading/Assignment	70 Hrs.
	Total student study effort	109 Hrs.
Reading List and References	Reading List 1. Statistical methods for spatial data analysis / Schabenberger & Gotway (2005) 2. Statistical methods in spatial epidemiology / Lawson (2006) 3. Statistical analysis of spatial and spatio-temporal point patterns / Diggle (2013) 4. Applied spatial data analysis with R / Bivand, Pebesma, & Gómez-Rubio (2013) 5. Applied spatial analysis of public health data / Lance & Carol (2003) 6. Big data: techniques and technologies in Geoinformatics / Hassan A. Karimi (2014) 7. Spatial statistics: geospatial information modeling and thematic mapping / Mohammed A. Kalkhan (2011) 8. Spatial data mining: theory and application / Li, Wang, & Li (2015)	