# Subject Description Form

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| **Subject Code** | LSGI3803 |
| **Subject Title** | **Spatial Data Analysis and Mining** |
| **Credit Value** | 3 |
| **Level** | 3 |
| **Pre- requisite/ Co- requisite/ Exclusion** | AMA2111 Mathematics I & COMP1011 Programming Fundamentals / COMP1012 Programming Fundamentals and Applications |
| **Objectives** | 1. To develop students' understanding on what geospatial data analysis and mining are.<br>2. To enable students to learn the methods of spatial data analysis and mining including classification, clustering analysis, pattern analysis, network analysis.<br>3. To enable students to properly apply spatial data analysis and mining techniques to practical problems. |
| **Intended Learning Outcomes** | Upon completion of the subject, students will be able to:<br><br>a. Explain the purpose of spatial data analysis and mining (L3)<br>b. Describe a range of data analysis and mining methods and their use in analyzing spatial data (L2)<br>c. Identify and select the appropriate methods for various real- world problems (L3)<br>d. Test models through validation and able to criticize their reliability (L4) |
| **Subject Synopsis/ Indicative Syllabus** | **Subject Synopsis**<br>Introduction of spatial data<br>• Spatial data acquisition and preprocessing<br>Data cleaning, calibration, and integration<br>• Exploratory Spatial data analysis and visualization<br>• Descriptive and regression analysis<br>Descriptive statistics for spatial data<br>Geographically weighted regression<br>• Point data pattern analysis<br>Quadrat estimation K functions<br>• Network analysis<br>Accessibility measurement<br>Shortest path algorithm<br>• Area data pattern analyses<br>Global spatial dependence<br>Local spatial dependence<br>• Spatial interpolation and surface analysis<br>Distance based interpolation<br>Geostatistics methods<br>• Spatial data mining<br>Classification<br>Clustering<br>Change detection |

<table>
<tr><td></td><td>Machine learning methods<br>Artificial intelligence methods</td></tr>
<tr><td>Teaching/ Learning Methodology</td><td>1. Lectures to explain theories and methodology;<br>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<br>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="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Assignment</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>2. Class Project</td><td>30%</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></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
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<br>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:<br><br>It consists of 100% continuous assessment through assignment (30%), class project (30%), and written test (40%). Assignment includes lab and tutorial. Through these activities, students will be assessed about thefundamental knowledge in spatial data mining and the practical capabilities of performing spatial data mining using actual data sets. Class project include student presentation and report. Problem based learning is carried out during the project work, and is reinforced by Q and A. Presentation contributes 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.<br><br>Generative AI can only serve as a tool for assisting initial idea development and proofreading for project presentation and report, and any involvement of generative AI tools must be clearly acknowledged and referenced. Students are required to make close link between the subject contents and the proposed case-specific scenario to encourage critical thinking.</td></tr>
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| **Student Study Effort Expected** | Class contact: | |
| | Lectures | 26 Hrs. |
| | Tutorials | 13 Hrs. |
| | Other student study effort: | |
| | Assignments/Self Study | 31 Hrs. |
| | Preparation and class project | 30 Hrs. |
| | Total student study effort | 120 Hrs. |
| **Reading List and References** | 1. Statistical methods for spatial data analysis / Schabenberger & Gotway (2005)<br>2. Statistical analysis of spatial and spatio-temporal point patterns / Diggle (2013)<br>3. Applied spatial data analysis with R / Bivand, Pebesma, & Gómez-Rubio (2013)<br>4. Applied spatial analysis of public health data / Lance & Carol (2003)<br>5. Spatial statistics: geospatial information modeling and thematic mapping / Mohammed A. Kalkhan (2011)<br>6. Spatial data mining: theory and application / Li, Wang, & Li (2015) | |