Subject Description Form

Subject Code	LSGI524A
Subject Title	Urban and Geospatial Big Data Analytics
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	The course prefers students to have a basic understanding of computer programming or relevant experiences in urban and geospatial big data analytics.
Objectives	This course aims to provide students with a foundational understanding of the acquisition, processing, analytics and visualization of different types of urban and geospatial big datasets, and their applications for urban planning, transportation development, urban resilience, disaster mitigation, environment assessment business intelligence, urban socioeconomics, and social inequality. Students will have opportunities to approach various urban issues from a critical point of view, and study how urban big datasets can be combined with algorithms and toolsets to address these issues. The course will also cover ethics, security and privacy issues, as well as usage and practice of open data in urban data analytics.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the definition and key characteristics of cities and urban issues b. Understand different types of urban and geospatial big data and their characteristics c. Obtain knowledge in the acquisition, processing, analytics and visualization of urban big data through computing programming or commercial software d. Apply algorithms or analytic solutions over big data to address particular urban issues

Subject Synopsis/ Indicative Syllabus	• Introduction to urban and geospatial big data
	  ○ Definition and evolution of cities and urban areas
	  ○ Urban planning, disaster management, economy, trade, and transport/mobility development
	• Urban big data acquisition
	  ○ Urban positioning technologies (e.g., GPS/GNSS)
	  ○ Satellite and airborne remote sensing technologies.
	  ○ Urban sensing technologies and user generated content (e.g., VGI (volunteered geographic information), geotagged social media, taxi GPS trajectories, smart card transaction records, mobile phone data, street view images, IoT devices).
	• Urban data mining and knowledge discovery
	  ○ Process of knowledge discovery
	  ○ What kinds of data can be mined
	  ○ Major issues in urban data mining
	  ○ Algorithms and analytical solutions

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Machine learning and AI for urban and geospatial analytics

Supervised, unsupervised, and semi-supervised classification
Object detection/counting
Traffic congestion prediction
Anomaly detection
Ai reimagined urban configuration and planning
Semantic and sentiment analysis (NLP)

Urban big data applications

Urban economics and social inequality
Urban environment exposure assessment
Urban transportation
Urban spatial structure
Urban planning
Urban logistics
Business intelligence
Urban resilience and disaster mitigation
Disease control and public health

Urban and geospatial big data visualization

Tools and platforms for urban data visualization
Visualization for different kinds of urban big data

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<tr><td>Teaching/Learning Methodology</td><td>1. Lectures to explain key theories for cities and geospatial data as well as analytical solutions for urban applications

2. Assignments 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 become critical in thinking; and

3. A group project is designed to enhance the critical thinking, team spirit, problem solving skills, 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. Assignment1</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Assignment2</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Group project including presentation and report</td><td>60%</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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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:**	
	▪ Lecture	39 Hrs.
	Other student study effort:	
	▪ Assignments & Course Reading	39 Hrs.
	▪ Group Project	52 Hrs.
	Total student study effort:	130 Hrs.
Reading List and References	Shi, W., 2021. Urban informatics. Springer Nature. Li, W., 2020. GeoAI: Where machine learning and big data converge in GIScience. Journal of Spatial Information Science, 2020(20), pp.71-77. Zheng Yu. Urban Computing. MIT Press, 2019. O'sullivan, David, and David Unwin. Geographic information analysis. John Wiley & Sons, 2014. Townsend, Anthony M. Smart cities: Big data, civic hackers, and the quest for a new utopia. WW Norton & Company, 2013. Batty, M., 2013. The new science of cities. MIT press. O'sullivan, Arthur. Urban economics. McGraw-Hill/Irwin, 2007.	