Subject Description Form

Subject Code	LSGI3804
Subject Title	**Urban Big Data Analytics**
Credit Value	3
Level	3
Pre-requisite	Nil
Objectives	This course aims to provide in-depth knowledge and hands-on techniques on urban big data analytics. It introduces the concept of urban big data, methods for collecting and cleansing these large data sets, and techniques for analyzing them. The course covers basic urban big data analysis through advanced machine learning methods, with hands-on labs. It also includes Geographic Information Systems (GIS)-based spatial analysis of urban big data, working with multiple raster and vector datasets. Additionally, the course explores applications for urban planning, environmental analysis, transportation and mobility, housing, urban sustainability and resilience, business intelligence, and urban socio-economics. Students will gain theoretical knowledge and practical skills to work with urban big data and apply analytical techniques to inform urban policy, planning, and management.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (1) Perform exploratory data analysis and visualization of urban data including data collection, cleansing, summary statistics, and basic modeling. (2) Obtain broad knowledge in fundamental concepts and Apply advanced analytical techniques such as machine learning algorithms to derive insights from large, complex urban data sets. (3) Analyze spatial relationships in urban data using Geographic Information Systems (GIS), including working with spatial datasets, geoprocessing, spatial statistics, and network analysis.
Subject Synopsis/ Indicative Syllabus	A. Introduction of urban big data and Analysis Tools B. Techniques for Collection and Cleansing of Urban Big Data o Aggregation o Systematic, stochastic, and gross error cleaning o Database technologies and spatiotemporal indexing C. Method and techniques in big data analysis and mining o Urban big data mining and knowledge discovery o Distributed and parallel computing o Deep learning and artificial intelligence o Visualization of urban big data o Bias of urban big data D. Exploration of Spatial Big Datasets for Urban Analysis o Standard Geoprocessing Techniques o Spatial Statistics in Urban Analysis

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Conducting Network Analysis Using GIS

E. Urban big data applications

Urban Mapping
Urban Climate
Urban planning
Smart cities
Urban logistics
Urban infrastructure
Economic growth
Internet of things

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<tr><td>Teaching/Learning Methodology</td><td>

Lectures to explain theories and methodology;
Practical Lab Exercises will be conducted using Matlab programming language and the ArcGis tool, providing hands-on experience and practical skill-building;
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
A group project is designed to enhance the critical thinking, team spirit, problem solving skill, leadership and presentation skill.

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<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="3">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>1</td><td>2</td><td>3</td></tr>
<tr><td>1. Lab assignments</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Project (Report)</td><td>35%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Project (Presentation)</td><td>35%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="3"></td></tr>
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Guidelines for Using Generative Artificial Intelligence:

Generative AI is solely permitted for language editing purposes and is not allowed to generating codes, answering questions, and or finding solutions for Class Projects.

References for other Generate-AI-related matters:
https://www.polyu.edu.hk/edc/-/media/department/edc/content/explore-a-topic/generative-ai/guidelines-on-the-use-of-generative-ai-final.pdf?la=en&hash=3F3FD8B6D0EBBF9A0D686B7F02C7A25F

Students are expected to submit declarations to demonstrate adherence to the aforementioned guidelines in Assessments and Class Projects.
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Student Study Effort Expected	Class contact:	
	🗁 Lectures	13 Hrs.
	🗁 Lab Sessions	26 Hrs.
	Other student study effort:	
	🗁 Project	60 Hrs.
	Total student study effort	99 Hrs.
Reading List and References	Menke, W., & Menke, J. (2016). Environmental data analysis with MatLab. Academic Press. Karimpour, A. Fundamentals of data science with MATLAB: Introduction to scientific computing, data analysis, and data visualization. Zheng Yu. Urban Computing. MIT Press, 2019. O'sullivan, David, and David Unwin. Geographic information analysis. John Wiley & Sons, 2014. 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.	