Hong Kong University of Science and Technology
Department of Civil and Environmental Engineering

Rubric Title of course Instructor Teaching Assistants	CIVL 4100S (Spring 22-23) Geographic Information System and Urban Data Science ZHANG, Fan PAN, Tianli; TANG, Justin Chi Wing
Course Description	Geographic Information Science (GIScience) provides important technologies to empower modern civil engineers and smart city applications. This course offers an introduction to a variety of geospatial technologies for managing and processing geospatial information, including geospatial data mapping, remote sensing, and spatial data analysis, in order to facilitate the development of a smarter city. More recently, the emergence of urban big data and advances in artificial intelligence have opened up new opportunities to sense urban dynamics and evaluate the processes and consequences of urbanization. Accordingly, this course will introduce the characteristics of the emerging urban big data and corresponding analytical methods in data visualization, data mining and artificial intelligence. Through a series of data-centric practical projects, this course will introduce students how urban data science can make a different in not only traditional civil engineering and urban studies, but also in supporting smart and sustainable cities through data-driven decision making.
Co-requisite Credit	N/A 3
Text book(s) & Reference book(s):	• Longley, Paul A., et al. Geographic information science and systems. John Wiley & Sons, 2015. • Shi, W., Goodchild, M., Batty, M., Kwan, M.-P., Zhang, A. (Eds.), 2021, Urban Informatics, Springer, ISBN 978-981-15-8983-6，941 pages. • Batty, Michael. The new science of cities. MIT press, 2013. • Bettencourt, L. M. (2021). Introduction to urban science: evidence and theory of cities as complex systems. The MIT Press.
Topics	• Introduction to GIS and Urban Data Science • Spatial Data & Representation in Civil Engineering • Spatial Data Visualization & Mapping for Smart City Development • Spatial Data Management & Spatial Database • 3D Data Modeling • Spatial Data Analysis & Regression • Spatial Data Analysis with Python • Urban Data Science for Urban Studies & Decision-making • Urban Big Data & Smart City Applications • Geographic Artificial Intelligence & computer vision
Assessment of Outcomes	1. Lab tutorial reports 25% 2. Mid-term exam 25% 3. Final project (final presentation & report) 50%