City University of Hong Kong
Course Syllabus

offered by School of Data Science
with effect from Semester A 2024/25

Part I Course Overview

Course Title:	Data Analytics for Smart Cities
Course Code:	SDSC6004
Course Duration:	One Semester
Credit Units:	3
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

Modern cities depend on data flows that connect users and infrastructure. Thus, data science skills are critical for design and operation of smart cities. The abundance of data, and statistical analysis and machine learning algorithms for utilizing the data are expected to significantly improve decisions about how urban infrastructure and its environment are maintained and built. Students in this course will learn basic, readily applicable data analytics, statistical methods, and machine learning algorithms that are useful for exploiting data obtained via crowd-sensing and remote sensing technologies within transportation, environmental, building, and power grids systems. Student will be exposed to four knowledge modules: mobility and transportation, building energy systems, extreme events and urban resilience, and climate change and environmental variability. Throughout the course, students will gain the ability of leveraging real data to solve smart city application problems via basic statistics and machine learning techniques.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	**Explain** data science principles in the design and operation of smart cities	20%	✓		
2.	**Learn** smart city applications that are revolutionized by the increasing availability of data	20%	✓		
3.	**Apply** the appropriate data science methods to various smart city applications	20%	✓		
4.	**Improve** the design or operation of a smart city by using data analytic methods	20%	✓	✓	
5.	**Explain** role of Internet of Things in a smart city	20%	✓	✓	
		100%			

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Learning and Teaching Activities (LTAs)

(LTAs designed to facilitate students' achievement of the CILOs.)

LTA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lectures	Learning through teaching is primarily based on lectures. Students will participate in mini-lectures and small-group exercises to facilitate conceptual understanding of smart cities and applications of various data science tools and techniques to improve smart cities.	✓	✓	✓	✓	✓	30 hours/sem
Tutorial Exercises	The team-based exercises provide students with the opportunities to familiarize and apply the data science tools learnt during the lectures through practical problem solving.			✓	✓	✓	9 hours/sem

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting	Remarks
	1	2	3	4	5		
Continuous Assessment: 50 %							
Attendance	✓	✓				5%	
Group Project	✓	✓	✓	✓		45%	
Examination: 50 % (duration: 2 hours , if applicable)							
Examination	✓	✓	✓	✓	✓	50%	
						100%	

For a student to pass the course, at least 30% of the maximum mark for the examination should be obtained.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Attendance	The attendance and interactive performance of students in each lecture and tutorials will be recorded to reflect the in-course performance	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Group Project	Students will practice in adopting a systematic and data science methodology based approach to realize a smart city application. Written report and oral presentation will be conducted. Such approach should be observable throughout the stream of problem identification and justification, data collection, data analysis, inferences, and discussion of implication of results.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	Students will examine their level of achievement of the intended learning outcomes via designed exams, with emphasis placed on conceptual understanding and correct application of data science methods for smart city applications.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Attendance	The attendance and interactive performance of students in each lecture and tutorials will be recorded to reflect the in-course performance	High	Significant	Basic	Not even reaching marginal levels
2. Group Project	Students will practice in adopting a systematic and data science methodology based approach to realize a smart city application. Written report and oral presentation will be conducted. Such approach should be observable throughout the stream of problem identification and justification, data collection, data analysis, inferences, and discussion of implication of results.	High	Significant	Basic	Not even reaching marginal levels
3. Examination	Students will examine their level of achievement of the intended learning outcomes via designed exams, with emphasis placed on conceptual understanding and correct application of data science methods for smart city applications.	High	Significant	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course).

- Recent worldwide smart city development initiatives and future trends
- Review of systems and processes concepts
- Review of data analytics and machine learning techniques commonly used in smart city applications
- Core smart city concept I: intelligent and green energy development
- Core smart city concept II: smart buildings and energy conservations
- Core smart city concept III: intelligent transportation and its infrastructure

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

Course powerpoint slides offered

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	McQueen, B. (2017). *Big Data Analytics for Connected Vehicles and Smart Cities*. Artech House.
2.	Dey, N., Hassanien, A. E., Bhatt, C., Ashour, A. S., & Satapathy, S. C. (Eds.). (2018). *Internet of Things and big data analytics toward next-generation intelligence*. Springer International Publishing.
3.	Dey, N. and Tamane, S. (2018). Big Data Analytics for Smart and Connected Cities. IGI Global. DOI: 10.4018/978-1-5225-6207-8