City University of Hong Kong
Course Syllabus

offered by Department of Biostatistics
with effect from Semester A 2024/25

Part I Course Overview

Course Title:	**Spatial Data Analysis**
Course Code:	**BIOS6901**
Course Duration:	**1 semester**
Credit Units:	**3 CUs**
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

This course aims to introduce the students to the science and art in dealing with geostatistical data and point patterns, with particular focus on making sense out of the data through design, inference, and diagnostics. Topics covered include geostatistics (with applications to epidemiology), estimation of variogram, ordinary and universal kriging, point process theory, space-time point patters.

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.	Appreciate the issues involved in choosing appropriate statistical methods for spatial data	15%	√	√	
2.	Formulate statistical models for spatial phenomena, and perform parameter estimation under these models by use of suitable computer software	50%	√	√	√
3.	Understand the pros and cons of different methods with ability to critically assess and improve models	35%	√	√	√
		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	
Teaching	Learning through teaching is primarily based on lectures	√	√	√	3 hours/ week
Assignments	Learning through assignments (including computer assignments) allows students to perform critical problem analysis and develop hands-on skills using software	√	√	√	

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		
Continuous Assessment: 60%					
Assignments/Project	√	√	√	30%	
Midterm	√	√	√	20%	
Class Participation	√	√	√	10%	
Examination: 40%					
Examination (duration: 2 hours)	√	√	√	40%	
				100%	

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. Assignments/Project	Problem solving skills and software knowledge	Consistently demonstrates a thorough understanding of spatial data analysis concepts and applies them to complex problems	Adequately demonstrates an understanding of spatial data analysis concepts and applies them to moderately complex problems	Demonstrates some understanding of spatial data analysis concepts and applies them to simple problems	Demonstrates little understanding of spatial data analysis concepts, or is unable to apply them to simple problems	Demonstrates little understanding of spatial data analysis concepts and is unable to apply them to problems
2. Class Participation	Communication skills	Actively participates in class discussions, group work, and activities, and consistently contributes to the learning of others	Participates in class discussions, group work, and activities, but not consistently or actively, and occasionally contributes to the learning of others	Minimally participates in class discussions, group work, and activities, and rarely contributes to the learning of others	Rarely participates in class discussions, group work, and activities, or does not contribute to the learning of others	Rarely participates in class discussions, group work, and activities, and does not contribute to the learning of others
3. Midterm Exam	Problem solving based on comprehensive understanding	Demonstrates a comprehensive understanding of spatial data analysis concepts and applies them to complex problems	Adequately demonstrates an understanding of spatial data analysis concepts and applies them to moderately complex problems	Demonstrates some understanding of spatial data analysis concepts and applies them to simple problems	Demonstrates little understanding of spatial data analysis concepts, or is unable to apply them to problems	Demonstrates little understanding of spatial data analysis concepts and is unable to apply them to problems

4. Final Exam	Problem solving based on comprehensive understanding	Consistently demonstrates a comprehensive understanding of spatial data analysis concepts and applies them to complex problems	Adequately demonstrates an understanding of spatial data analysis concepts and applies them to moderately complex problems	Demonstrates some understanding of spatial data analysis concepts and applies them to simple problems	Demonstrates little understanding of spatial data analysis concepts, or is unable to apply them to problems	Demonstrates little understanding of spatial data analysis concepts and is unable to apply them to problems

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. Assignments/Project	Problem solving skills and software knowledge	Consistently demonstrates a thorough understanding of spatial data analysis concepts and applies them to complex problems	Adequately demonstrates an understanding of spatial data analysis concepts and applies them to moderately complex problems	Demonstrates some understanding of spatial data analysis concepts and applies them to simple problems	Demonstrates little understanding of spatial data analysis concepts and is unable to apply them to problems
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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.)

Stationarity, variograms, kriging, spatial regression, space-time models, Gibbs-Markov fields,spatial auto-regression, point processes

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.)

Nil

2.2 Additional Readings

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

1.	Statistics for Spatial Data, by Noel Cressie
2.	Spatial Statistics and Modeling, by Gaetan, Carlo, Guyon, Xavier