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: **Selected Topics in Biostatistics**

Course Code: **BIOS8005**

Course Duration: **1 Semester**

Credit Units: **3 CUs**

Level: **R8**

**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**

The course aims to introduce research students to one active, advanced and specialized field in Biostatistics (e.g. causal inference, genomic analysis, high-dimensional data analysis, post-model selection, reinforcement learning, survival analysis, time series analysis, etc.). It will help students to develop a solid and comprehensive understanding of the fundamental concepts, methods and theories in the chosen field and equip them with necessary techniques and knowledge for conducting independent and innovative research.

2.   **Course Intended Learning Outcomes (CILOs)**

No.	CILOs[#]	Weighting	Discovery-enriched curriculum related learning outcomes		
			A1	*A2*	*A3*
1.	Explain the fundamental concepts and methods.	20%	✓	✓	
2.	Develop a solid understanding of the techniques.	20%	✓	✓	
3.	Conduct a thorough reading of the literature and know current state-of-the-art tools.	20%	✓	✓	✓
4.	Apply the techniques and methods to real data applications.	20%	✓	✓	✓
5.	Develop independent research skills and abilities	10%	✓	✓	✓
6.	Effectively communicate and present research results	10%	✓	✓	✓
		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 self-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)

LTA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5	6	
Lectures	Learning through teaching is primarily based on lectures	✓	✓	✓	✓	✓	✓	3 hours/week
Assignments	Learning through take-home assignments helps students understand the key concepts and acquire the techniques	✓	✓	✓	✓	✓	✓	After class

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4	5	6		
Continuous Assessment: 50%								
Assignments	✓	✓	✓	✓			30%	Help to train students with basic knowledge, concepts, and analysis techniques
Midterm/quizzes	✓	✓	✓	✓	✓	✓	20%	Test students' capabilities in applying the knowledge to solve relevant problems
Examination: 50% (duration: 3 hours)	✓	✓	✓	✓	✓	✓	50%	Examination questions are designed to see how well students have achieved the learning objectives and acquired the requisite techniques for problem-solving
							100%	

5. Assessment 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	Problem solving skills	Consistently exhibits adept comprehension of biostatistics concepts and methods and their practical implementation	Sufficient knowledge in applying biostatistics concepts and methods to moderately challenging problems	Displays basic ability to use biostatistics concepts and methods and their applications to routine problems	Understand basic biostatistical issues related to routine problems	Inadequate comprehension of biostatistics concepts and methods and lacks the ability to apply them to problem-solving
2. Midterm/quizzes	Problem solving based on comprehensive understanding	Exhibits a thorough grasp of time to biostatistics concepts and methods and effectively applies them to intricate problems	Displays sufficient understanding of biostatistics concepts and methods and effectively applies them to moderately challenging problems	Shows basic comprehension of biostatistics concepts and methods and applies them to routine problems	Displays basic understanding of biostatistical concepts and their relationships to routine problems	Insufficient grasp of biostatistics concepts and methods and lacks the ability to apply them to problem-solving
3. Examination	Problem solving based on comprehensive understanding	Consistently exhibits a deep understanding of biostatistics concepts and methods and effectively applies them to complex problems	Effectively applies biostatistics concepts and methods to moderately complex problems, demonstrating sufficient understanding	Applies biostatistics concepts and methods to simple problems with a basic understanding	Displays basic understanding of biostatistical concepts and their relationships to routine problems	Lacks understanding of biostatistics concepts and methods and cannot apply them to problem-solving

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	Problem solving skills	Consistently exhibits adept comprehension of biostatistics concepts and methods and their practical implementation	Sufficiently applies biostatistics concepts and methods to moderately challenging problems	Displays basic grasp of biostatistics concepts and methods and their application to standard problems	Insufficient comprehension of biostatistics concepts and methods and lacks the ability to apply them to problem-solving
2. Midterm/quizzes	Problem solving based on comprehensive understanding	Exhibits a thorough grasp of time to biostatistics concepts and methods and effectively applies them to intricate problems	Displays adequate understanding of biostatistics concepts and methods and effectively applies them to moderately challenging problems	Shows basic comprehension of biostatistics concepts and methods and applies them to standard problems	Insufficient understanding of biostatistics concepts and methods and lacks the ability to apply them to problem-solving
3. Examination	Problem solving based on comprehensive understanding	Consistently exhibits an in depth understanding of biostatistics concepts and methods and effectively applies them to real problems	Effectively applies biostatistics concepts and methods to moderately challenging problems	Applies biostatistics concepts and methods to standard problems and demonstrates a basic understanding	Lacks understanding of biostatistics concepts and methods and cannot apply them to problem-solving

Part III   Other Information

1.   Keyword Syllabus

Causal inference, genomic analysis, high-dimensional data analysis, post-model selection, reinforcement learning, survival analysis, time series analysis

2.   Reading List
2.1   Compulsory Readings

Nil.

2.2   Additional Readings

1.	Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction (Cambridge University Press; 1st edition), by Guido W. Imbens and Donald B. Rubin
2.	High-Dimensional Statistics (Cambridge University Press), by Martin J. Wainwright