

# BIOS8005: SELECTED TOPICS IN BIOSTATISTICS

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## Effective Term

Semester A 2025/26

## Part I Course Overview

### Course Title

Selected Topics in Biostatistics

### Subject Code

BIOS - Biostatistics

### Course Number

8005

### Academic Unit

Biostatistics (BIOS)

### College/School

College of Computing (CC)

### Course Duration

One Semester

### Credit Units

3

### Level

R8 - Research Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### 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, regularised regression, generalized linear models, regression for counts, 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.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1 Explain the fundamental concepts and methods.	20	x	x	
2 Develop a solid understanding of the techniques.	20	x	x	
3 Conduct a thorough reading of the literature and know current state-of-the-art tools.	20	x	x	x
4 Apply the techniques and methods to real data applications.	20	x	x	x
5 Develop independent research skills and abilities	10	x	x	x
6 Effectively communicate and present research results	10	x	x	x

#### 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.

### Learning and Teaching Activities (LTAs)

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

### Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3, 4	30	Help to train students with basic knowledge, concepts, and analysis techniques	Yes
2	Midterm/quizzes	1, 2, 3, 4, 5, 6	20	Test students' capabilities in applying the knowledge to solve relevant problems	No

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

3

**Minimum Continuous Assessment Passing Requirement (%)**

40

**Minimum Examination Passing Requirement (%)**

40

**Additional Information for ATs**

Examination questions are designed to see how well students have achieved the learning objectives and acquired the requisite techniques for problem-solving.

To pass the course, students are required to obtain a minimum of 40% in continuous assessment and a minimum of 40% in the examination.

**Assessment Rubrics (AR)****Assessment Task**

Assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Problem solving skills

**Excellent**

(A+, A, A-) Consistently exhibits adept comprehension of biostatistics concepts and methods and their practical implementation

**Good**

(B+, B, B-) Sufficient knowledge in applying biostatistics concepts and methods to moderately challenging problems

**Fair**

(C+, C, C-) Displays basic ability to use biostatistics concepts and methods and their applications to routine problems

**Marginal**

(D) Understand basic biostatistical issues related to routine problems

**Failure**

(F) Inadequate comprehension of biostatistics concepts and methods and lacks the ability to apply them to problem-solving

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**Assessment Task**

Midterm/quizzes (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Problem solving based on comprehensive understanding

**Excellent**

(A+, A, A-) Exhibits a thorough grasp of time to biostatistics concepts and methods and effectively applies them to intricate problems

**Good**

(B+, B, B-) Displays sufficient understanding of biostatistics concepts and methods and effectively applies them to moderately challenging problems

**Fair**

(C+, C, C-) Shows basic comprehension of biostatistics concepts and methods and applies them to routine problems

**Marginal**

(D) Displays basic understanding of biostatistical concepts and their relationships to routine problems

**Failure**

(F) Insufficient grasp of biostatistics concepts and methods and lacks the ability to apply them to problem-solving

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**Assessment Task**

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Problem solving based on comprehensive understanding

**Excellent**

(A+, A, A-) Consistently exhibits a deep understanding of biostatistics concepts and methods and effectively applies them to complex problems

**Good**

(B+, B, B-) Effectively applies biostatistics concepts and methods to moderately complex problems, demonstrating sufficient understanding

**Fair**

(C+, C, C-) Applies biostatistics concepts and methods to simple problems with a basic understanding

**Marginal**

(D) Displays basic understanding of biostatistical concepts and their relationships to routine problems

**Failure**

(F) Lacks understanding of biostatistics concepts and methods and cannot apply them to problem-solving

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**Assessment Task**

Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

Problem solving skills

**Excellent**

(A+, A, A-) Consistently exhibits adept comprehension of biostatistics concepts and methods and their practical implementation

**Good**

(B+, B) Sufficiently applies biostatistics concepts and methods to moderately challenging problems

**Marginal**

(B-, C+, C) Displays basic grasp of biostatistics concepts and methods and their application to standard problems

**Failure**

(F) Insufficient comprehension of biostatistics concepts and methods and lacks the ability to apply them to problem-solving

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**Assessment Task**

Midterm/quizzes (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

Problem solving based on comprehensive understanding

**Excellent**

(A+, A, A-) Exhibits a thorough grasp of time to biostatistics concepts and methods and effectively applies them to intricate problems

**Good**

(B+, B) Displays adequate understanding of biostatistics concepts and methods and effectively applies them to moderately challenging problems

**Marginal**

(B-, C+, C) Shows basic comprehension of biostatistics concepts and methods and applies them to standard problems

**Failure**

(F) Insufficient understanding of biostatistics concepts and methods and lacks the ability to apply them to problem-solving

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**Assessment Task**

Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

Problem solving based on comprehensive understanding

**Excellent**

(A+, A, A-) Consistently exhibits an in depth understanding of biostatistics concepts and methods and effectively applies them to real problems

**Good**

(B+, B) Effectively applies biostatistics concepts and methods to moderately challenging problems

**Marginal**

(B-, C+, C) Applies biostatistics concepts and methods to standard problems and demonstrates a basic understanding

### Failure

(F) Lacks understanding of biostatistics concepts and methods and cannot apply them to problem-solving

## Part III Other Information

### Keyword Syllabus

Causal inference, genomic analysis, high-dimensional data analysis, post-model selection, reinforcement learning, survival analysis, time series analysis, regularised regression, generalized linear models, regression for counts

### Reading List

#### Compulsory Readings

Title	
1	Nil

#### Additional Readings

Title	
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
3	Foundations of Linear and Generalized Linear Models, by Alan Agresti
4	An Introduction to Statistical Learning with Applications in R, by Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani
5	Extending the Linear Model with R: Generalized Linear, Mixed Effects and Nonparametric Regression Models, by Julian J. Faraway
6	Regression Analysis of Count Data, by A. Colin Cameron and Pravin K. Trivedi