BIOS5800: PROBABILITY

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Probability

Subject Code
BIOS - Biostatistics
Course Number
5800

Academic Unit
Biostatistics (BIOS)

College/School
College of Computing (CC)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate 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 present the fundamental principles behind probability and lay down the foundations for understanding various topics such as statistical inference, multivariate analysis, regression modelling and survival analysis. Students

will learn how to implement probabilistic methods in various types of applications. Topics covered include: axioms of probability, random variables, distribution functions in one or more dimensions, correlation, moments, conditional probabilities and densities; pseudo-random number generation; survival functions, hazard functions and odds ratios; moment generating functions and characteristic functions; infinite sequences of random variables, weak and strong laws of large numbers and the multivariate central limit theorem.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand the fundamental principles of probability	40	x	x	
2	Ability to formulate probabilistic models in various types of applications involving public health	40	x	x	x
3	Appreciate the relevance of probabilistic thinking in data analysis	20	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	Teaching	Learning through teaching based on lectures	1, 2, 3	3 hours/ week
2	Assignments	Learning through assignments allows students to perform critical problem analysis and develop hands-on skills involving probability	1, 2, 3	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3	30	-	No
2	Midterm/quizzes	1, 2, 3	30	-	No

Continuous Assessment (%)
60

Examination (%)

40

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

35

Additional Information for ATs

To pass the course, students are required to obtain a minimum of 40% in continuous assessment and a minimum of 35% 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 demonstrates a thorough understanding of probability concepts and applies them to complex problems

Good

(B+, B, B-) Adequately demonstrates an understanding of probability concepts and applies them to moderately complex problems

Fair

(C+, C, C-) Demonstrates some understanding of probability concepts and applies them to simple problems

Marginal

(D) Demonstrate limited understanding of probability concepts and applies them to basic problems with some errors

Failure

(F) Demonstrates little understanding of probability concepts and is unable to apply them to problems

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Assessment Task

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-) Consistently applies probability concepts and methods to solve complex problems

Good

(B+, B, B-) Adequately applies probability concepts and methods to solve moderately complex problems

Fair

(C+, C, C-) Applies probability concepts and methods to solve simple problems with limited success

Marginal

(D) Applies simple probability methods to solve basic problems with little success

Failure

(F) Inappropriately or unable to apply probability concepts and methods to solve problems

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Assessment Task

Midterm Exam (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-) Demonstrates a comprehensive understanding of probability concepts and applies them to complex problems

Good

(B+, B, B-) Adequately demonstrates an understanding of probability concepts and applies them to moderately complex problems

Fair

(C+, C, C-) Demonstrates some understanding of probability concepts and applies them to simple problems

Marginal

(D) Demonstrates limited understanding of probability concepts and applies them to solve basic problems with little success

Failure

(F) Demonstrates little understanding of probability concepts and is unable to apply them to problems

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Assessment Task

Final Exam (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 demonstrates a comprehensive understanding of probability concepts and applies them to complex problems

Good

(B+, B, B-) Adequately demonstrates an understanding of probability concepts and applies them to moderately complex problems

Fair

(C+, C, C-) Demonstrates some understanding of probability concepts and applies them to simple problems

Marginal

(D) Demonstrates limited understanding of probability concepts and applies them to solve basic problems with little success

Failure
(F) Demonstrates little understanding of probability concepts and is unable to apply them to problems

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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 demonstrates a thorough understanding of probability concepts and applies them to complex problems

Good
(B+, B) Adequately demonstrates an understanding of probability concepts and applies them to moderately complex problems

Marginal
(B-, C+, C) Demonstrates some understanding of probability concepts and applies them to simple problems

Failure
(F) Demonstrates little understanding of probability concepts and is unable to apply them to problems

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Assessment Task
Quizzes (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Problem solving based on comprehensive understanding

Excellent
(A+, A, A-) Consistently applies probability concepts and methods to solve complex problems

Good
(B+, B) Adequately applies probability concepts and methods to solve moderately complex problems

Marginal
(B-, C+, C) Applies probability concepts and methods to solve simple problems with limited success

Failure
(F) Inappropriately or unable to apply probability concepts and methods to solve problems

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

Criterion
Problem solving based on comprehensive understanding

Excellent
(A+, A, A-) Demonstrates a comprehensive understanding of probability concepts and applies them to complex problems

Good

(B+, B) Adequately demonstrates an understanding of probability concepts and applies them to moderately complex problems

Marginal

(B-, C+, C) Demonstrates some understanding of probability concepts and applies them to simple problems

Failure

(F) Demonstrates little understanding of probability concepts and is unable to apply them to problems

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Assessment Task

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

Criterion

Problem solving based on comprehensive understanding

Excellent

(A+, A, A-) Consistently demonstrates a comprehensive understanding of probability concepts and applies them to complex problems

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(B+, B) Adequately demonstrates an understanding of probability concepts and applies them to moderately complex problems

Marginal

(B-, C+, C) Demonstrates some understanding of probability concepts and applies them to simple problems

Failure

(F) Demonstrates little understanding of probability concepts and is unable to apply them to problems

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Part III Other Information

Keyword Syllabus

Axioms of probability, random variables, distributions, conditional probabilities, laws of large numbers, central limit theorem

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Introduction to Probability, Second Edition (Chapman & Hall/CRC Texts in Statistical Science) by Joseph K. Blitzstein and Jessica Hwang