BIOS5800: PROBABILITY

Effective Term Semester B 2024/25

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

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	s)
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	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.

	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	

Learning and Teaching Activities (LTAs)

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3	30	
2	Midterm/quizzes	1, 2, 3	30	

Continuous Assessment (%)

Examination (%)

40

Examination Duration (Hours)

2

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

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

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

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

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

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

Assessment Task

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

Criterion

Problem solving based on comprehensive understanding

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

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Assessment Task

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

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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