BIOS8006: LONGITUDINAL DATA ANALYSIS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Longitudinal Data Analysis

Subject Code
BIOS - Biostatistics
Course Number
8006

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 acquaint research students with statistical models and methods utilized for the analysis of longitudinal data. Longitudinal data pertains to information gathered repeatedly from individuals, be it humans, animals, plants, or

participants, over time or different locations. The course will primarily emphasize the practical application of statistical models, specifically linear mixed-effects (LME) models, nonlinear mixed-effects (NLME) models, and generalized linear mixed-effects (GLME) models. Through hands-on experience with statistical software, students will gain the ability to directly employ these models. Upon completion of the course, students will possess the skills to proficiently analyze longitudinal data and effectively interpret the resulting analyses.

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.	30	x	x	x
4	Apply the techniques and methods to real data applications.	30	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	3 hours/week
2	Assignments	Learning though take-home assignments helps students understand the key concepts and acquire the techniques	1, 2, 3, 4	After class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3, 4	40	Help to train students with basic knowledge, concepts, and analysis techniques	Yes

2	Midterm/quizzes	1, 2, 3, 4	20	Test students' capabilities in applying the knowledge to solve relevant problems	No

Continuous Assessment (%)

60

Examination (%)

40

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 longitudinal data analysis principles and their practical implementation

Good

(B+, B, B-) Sufficiently applies longitudinal data analysis concepts to moderately complex problems

Fair

(C+, C, C-) Demonstrates a moderate understanding of longitudinal data analysis concepts and their practical application to intermediate-level problems.

Marginal

(D) Displays basic grasp of longitudinal data analysis concepts and their application to straightforward problems.

Failure

(F) Shows limited comprehension of longitudinal data analysis concepts 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 longitudinal data analysis concepts and effectively applies them to intricate problems

Good

(B+, B, B-) Displays sufficient understanding of longitudinal data analysis concepts and effectively applies them to moderately complex problems

Fair

(C+, C, C-) Exhibits a moderate level of comprehension regarding longitudinal data analysis concepts and effectively applies them to intermediate-level problems.

Marginal

(D) Shows basic comprehension of longitudinal data analysis concepts and applies them to straightforward problems

Failure

(F) Displays limited grasp of longitudinal data analysis concepts 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 longitudinal data analysis concepts and effectively applies them to complex problems

Good

(B+, B, B-) Effectively applies longitudinal data analysis concepts to moderately complex problems, demonstrating sufficient understanding

Fair

(C+, C, C-) Applies longitudinal data analysis concepts to intermediate-level problems with a moderate level of understanding.

Marginal

(D) Applies longitudinal data analysis concepts to simple problems with a basic understanding

Failure

(F) Lacks understanding of longitudinal data analysis concepts 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 longitudinal data analysis principles and their practical implementation

Good

(B+, B) Sufficiently applies longitudinal data analysis concepts to moderately complex problems

Marginal

(B-, C+, C) Displays basic grasp of longitudinal data analysis concepts and their application to straightforward problems.

Failure

(F) Shows limited comprehension of longitudinal data analysis concepts 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 longitudinal data analysis concepts and effectively applies them to intricate problems

Good

(B+, B) Displays sufficient understanding of longitudinal data analysis concepts and effectively applies them to moderately complex problems

Marginal

(B-, C+, C) Shows basic comprehension of longitudinal data analysis concepts and applies them to straightforward problems

Failure

(F) Displays limited grasp of longitudinal data analysis concepts 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 a deep understanding of longitudinal data analysis concepts and effectively applies them to complex problems

Good

(B+, B) Effectively applies longitudinal data analysis concepts to moderately complex problems, demonstrating sufficient understanding

Marginal

(B-, C+, C) Applies longitudinal data analysis concepts to simple problems with a basic understanding

Failure

(F) Lacks understanding of longitudinal data analysis concepts and cannot apply them to problem-solving

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Part III Other Information

Keyword Syllabus

Longitudinal study design, repeated measurements analysis, linear mixed-effects model, nonlinear mixed-effects models, generalized linear mixed-effects models

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Mixed-Effects Models in S and S- PLUS (Springer) by Pinheiro, J.C. and Bates, D.M.
2	Linear Mixed-Effects Models Using R: A Step-by-Step Approach (Springer) by Galecki, A. and Burzykowski, T.
3	Analysis of Longitudinal Data (Oxford University Press, second edition), by Diggle, P.J., Heagerty, P., Liang, K.Y., and Zeger, S.L.