# BIOS5802: ADVANCED METHODS IN BIOSTATISTICS

**Effective Term**
Semester A 2025/26

## Part I Course Overview

**Course Title**
Advanced Methods in Biostatistics

**Subject Code**
BIOS - Biostatistics
**Course Number**
5802

**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**

This course aims to provide students with the tools to carry out regression analyses involving non-continuous (e.g., binary or count-valued) responses, correlated observations, and censored data. Topics covered include: generalized linear models (GLM) for non-Gaussian response, mixed-effects models and generalized estimating equations (GEE) for correlated observations, longitudinal data analysis, and Cox proportional hazards models for the analysis of survival time outcomes. Examples are drawn from public health and the biomedical sciences.

**Course Intended Learning Outcomes (CILOs)**

| | CILOs | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|---|---|---|---|---|---|
| 1 | Develop and fit regression models for discrete responses | 40 | x | x | |
| 2 | Develop and fit regression models that adjust for correlated data and censored observations | 40 | x | x | x |
| 3 | Interpret regression models and results in public health | 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 regression modelling | 1, 2, 3 | |

**Assessment Tasks / Activities (ATs)**

| | ATs | CILO No. | Weighting (%) | Remarks ("-" for nil entry) | Allow Use of GenAI? |
|---|---|---|---|---|---|
| 1 | Assignments | 1, 2, 3 | 20 | - | No |
| 2 | Midterm/quiz | 1, 2, 3 | 40 | - | 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 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 regression analyses concepts and applies them to complex problems

**Good**

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

**Fair**

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

**Marginal**

(D) Demonstrates some understanding of regression analyses concepts but is unable to apply them to problems

**Failure**

(F) Demonstrates no understanding of regression analyses concepts and is unable to apply them to problems

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**Assessment Task**

Quizzes/ 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 regression analyses concepts and applies them to complex problems

**Good**

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

**Fair**

(C+, C, C-) Applies regression analyses concepts and methods to solve simple problems

**Marginal**

(D) Applies regression analyses concepts and methods to solve simple problems but is unable to interpret results

**Failure**

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

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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 demonstrates a comprehensive understanding of regression analyses concepts and applies them to complex problems

**Good**

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

**Fair**

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

**Marginal**

(D) Demonstrates some understanding of regression analyses concepts but is unable to apply them to problems

**Failure**

(F) Demonstrates no understanding of regression analyses concepts and is unable to apply them to problems

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**Assessment Task**

Assignment (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 regression analyses concepts and applies them to complex problems

**Good**

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

**Marginal**

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

**Failure**

(F) Demonstrates no understanding of regression analyses concepts and is unable to apply them to problems

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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-) Demonstrates a comprehensive understanding of regression analyses concepts and applies them to complex problems

**Good**

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

**Marginal**

(B-, C+, C) Applies regression analyses concepts and methods to solve simple problems

**Failure**

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

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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 demonstrates a comprehensive understanding of regression analyses concepts and applies them to complex problems

**Good**

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

**Marginal**

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

**Failure**

(F) Demonstrates no understanding of regression analyses concepts and is unable to apply them to problems

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# Part III Other Information

**Keyword Syllabus**

Generalized linear models, correlated observations, censored data, longitudinal data.

**Reading List**

**Compulsory Readings**

| | Title |
|---|---|
| 1 | Analysis of Longitudinal Data (Oxford Statistical Science Series) 2nd Editionby Peter Diggle Patrick Heagerty, K.Y. Liang, and Scott Zeger |

**Additional Readings**

| | Title |
|---|---|
| 1 | Generalized Linear Models with Examples in R (Springer Texts in Statistics) by Dunn and Smyth |
| 2 | Applied Survival Analysis Using R by Dirk F. Moore |