MS2602: STATISTICAL INFERENCE

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Statistical Inference

Subject Code
MS - Decision Analytics and Operations
Course Number
2602

Academic Unit
Decision Analytics and Operations (DAOS)

College/School
College of Business (CB)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
MA2510 Probability and Statistics

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract
Statistical methods have proven enormously valuable in helping scientists interpret the results of their experiments. This is a course about how statisticians draw conclusions from experimental data. Its primary goal is to introduce the student

to an important type of reasoning that statisticians call 'inference'. Rather than provide a superficial introduction to a wide variety of inferential methods, we will concentrate on fundamental concepts and study a few of them in depth, while encourage students to think critically about how to apply statistical inference methods in data. Statistical inference rests on the mathematical foundation of probability. Students having taken an introductory course in probability will benefit most from this course. Many statistical procedures rely on softwares for their implementation. This is done through the elegant MATLAB, a software favoured by engineers, mathematicians as well as scientists. Other software like R may also be used.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Demonstrate an understanding of the theory of statistical inference, including estimation and hypothesis testing, and apply these concepts to real-world data.		x	x	
2	Utilize MATLAB to implement and execute the statistical inference techniques learned in the course.				x
3	Analyze and evaluate the application of fundamental statistical inference methods to experimental data, demonstrating an understanding of their theoretical underpinnings and practical implications.		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	Lecture	Students will attend and actively participate in lectures to understand the theoretical foundations of statistical inference, including estimation and hypothesis testing, which will help them demonstrate these concepts	1	2
2	In-class exercises	Students will engage in in-class exercises to apply statistical inference concepts to sample datasets	1, 3	1

3	Hand-in assignments	Students will complete hand-in assignments to implement and execute statistical inference techniques	2	Not applicable
4	Lab sessions	Students will work on lab projects that involve real-world datasets to demonstrate understanding of statistical inference theory, apply these concepts, and evaluate the results critically	1, 2, 3	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Hand-in assignments Students will be asked to solve problems related to the topics covered in the lectures to ensure they can follow the progress.	1, 2	10	-	Yes
2	Test(s) Test will be used to assess students on their understanding of the main concepts learned in the course.	1, 2, 3	30	-	No

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

Written Examination The exam is designed to assess students' knowledge towards statistical inference and their ability to formulate and solve business problems using inferential statistics.

Assessment Rubrics (AR)

Assessment Task

Hand-in assignments

Criterion
1. The ability to solve mathematical problems involving estimation and hypothesis testing.

2. The ability to write MATLAB codes and interpret MATLAB printouts.

Excellent (A+, A, A-)
Strong evidence of the capacity to analyse and synthesize; superior grasp of subject matter.

Good (B+, B, B-)
Evidence of grasp of subject ; reasonable understanding of issues.

Fair (C+, C, C-)
Student who has some understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)
Sufficient familiarity with the subject matter to enable the student to progress.

Failure (F)
Little evidence of familiarity with the subject matter; weakness in critical and analytic skills.

Assessment Task
Test(s)

Criterion
As above

Excellent (A+, A, A-)
Strong evidence of the capacity to analyse and synthesize; superior grasp of subject matter.

Good (B+, B, B-)
Evidence of grasp of subject ; reasonable understanding of issues.

Fair (C+, C, C-)
Student who has some understanding of the subject; ability to develop solutions to simple problems in the material.

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Failure (F)
Little evidence of familiarity with the subject matter; weakness in critical and analytic skills.

Assessment Task
Examination

Criterion
As above

Excellent (A+, A, A-)
Strong evidence of the capacity to analyse and synthesize; superior grasp of subject matter.

Good (B+, B, B-)
Evidence of grasp of subject ; reasonable understanding of issues.

Fair (C+, C, C-)
Student who has some understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)
Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)
Little evidence of familiarity with the subject matter; weakness in critical and analytic skills.

Part III Other Information

Keyword Syllabus

Revision of basic probability theory; Sufficient statistics; Ney factorization; Moment generating function; Theory of point estimation: unbiased and consistent estimators, Cramer-Rao bound, Fisher information, methods of moments, maximum likelihood and least squares. Confidence interval estimation. Theory of hypothesis testing: Neyman-Pearson lemma, (uniformly) most powerful test, generalized likelihood ratio test, Wilks' theorem, Chi-square test for goodness-of-fit and independence. one-way and two-way ANOVA.

Reading List

Compulsory Readings

	Title
1	Probability & Statistical Inference – Hogg, Tanis & Zimmerman (9/e, Pearson, 2015)
2	Statistics Toolbox for Use with MATLAB http://www.mathworks.com/help/stats/index.html

Additional Readings

	Title
1	Introduction to Mathematical Statistics – Hogg, McKean & Craig (7/e, Pearson, 2012)