MS2602: STATISTICAL INFERENCE

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Statistical Inference

Subject Code
MS - Management Sciences
Course Number
2602

Academic Unit
Management Sciences (MS)

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
MA2506 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	understand the theory of statistical inference including estimation and hypothesis testing and be able to apply them to real world data	80	x	x	x
2	be able to use MATLAB to implement and execute techniques learnt	20		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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Statistical inference, relevant knowledge and concepts are explained.	1, 2	2
2	In-class exercises	In-class problem solving allows instant feedback from students	1	1
3	Hand-in assignments	Strengthens the understanding of topics covered in lectures	1, 2	Not applicable
4	Lab sessions	Students to learn how to use softwares like MATLAB or R to perform data analysis of inferential statistics	1, 2	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
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	
2	Test(s) Test will be used to assess students on their understanding of the main concepts learned in the course.	1, 2	30	

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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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)