MS3227: PROBABILITY THEORY IN DECISION MAKING

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Probability Theory in Decision Making

Subject Code
MS - Department of Decision Analytics and Operations
Course Number
3227

Academic Unit
Department of 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
Nil

Precursors
CB2200 Business Statistics

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This undergraduate course introduces students to the fundamental concepts of probability and uncertainty as they apply to business studies. The curriculum is designed to foster probabilistic thinking, a crucial skill in today's dynamic business environment. Students will explore key probability concepts and their practical applications in various business scenarios. Through a combination of theoretical foundations and real-world examples, the course helps students develop a robust understanding of how uncertainty affects business decision-making. Topics covered include basic probability theory, random variables, probability distributions, and statistical inference, all presented within relevant business contexts. By the end of the course, students will be equipped to analyze business situations through a probabilistic lens, enabling them to make more informed decisions in the face of uncertainty. This foundational knowledge will prove invaluable across various business disciplines, including finance, marketing, and operations management, preparing students for advanced studies and real-world business challenges.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain and apply concepts of basic probability, including conditional probability, Bayes Theorem, and the notion of independence of two or more events.	35		x	
2	Describe and apply the concepts of discrete and continuous random variables and probability distributions, including Bernoulli, binomial, geometric, Poisson, uniform, normal, and exponential.	35		x	
3	Interpret and apply limiting theorems, including strong and weak laws of large number, and central limit theorem	20		x	
4	Select appropriate probability concepts and notion to model and analyse real-life business problems, interpret the results and give recommendations for business decision making.	10	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	Students will actively participate in interactive lectures to develop a comprehensive understanding of the essential background knowledge, definitions, and key concepts in probability and uncertainty, and their real-world applications.	1, 2, 3, 4	
2	Tutorials	Students will actively participate in tutorials to enhance the understanding of probability concepts within a real world context, and the interpretation of the results. Students will engage in small-group discussion to understand how the probability and uncertainty concepts that can be applied to real-world business problems.	1, 2, 4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Test The test will assess the students' understanding of the probability concepts and theory, and ability to apply concepts to business decision makings.	1, 2, 4	20	
2	Assignments Individual assignments to enhance students' ability to identify relevant probability concepts to analyse and solve business decision makings.	2, 3, 4	30	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)
3

Additional Information for ATs
Written Examination The examination will assess the students' ability to select and apply the probability concepts and methods to solve business problems and to interpret the implications of probability concepts in real-world decision making.

Assessment Rubrics (AR)

Assessment Task
Test

Criterion
1.1 ABILITY to DEFINE the probability terminologies.

1.2 ABILITY to SELECT and APPLY different probability methods to business decision makings.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Assignments

Criterion
2.1 ABILITY to IDENTIFY a set of relevant probability concepts to real-world problems.

2.2 ABILITY to APPLY the relevant probability concepts to ANALYSE business problems.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Written Examination

Criterion
3.1 ABILITY to SELECT and APPLY different probability methods to business decision makings.

3.2 ABILITY to INTERPRET the implications of probability concepts in business decision making.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Elements of Probability
Introduction to integration and differentiation, set theory, sample space, events, expectation, independence, conditional probability, multiplication law, Bayes theorem, etc.

Important probability distributions
Discrete and continuous probability distributions and their modeling being used in business applications. Applications in business context, including quality control, customer satisfaction, queueing models, service system management, and simulation.

Joint probability distributions
Joint probability distribution and models with dependent random variables in business applications. Applications in business context, including resource pooling, portfolio selection, finance, etc.

Limiting Theorems
Basic concepts of convergence, strong and weak law of large numbers, central limit theorem. Applications in business context, including insurance and risk control in stock market.

Stochastic Processes
Models of stochastic processes in business applications. Applications in business context, including inventory management and risk control in loan management.

Reading List

Compulsory Readings

	Title
1	Mario Lefebvre. Basic Probability Theory with Applications. Springer.

Additional Readings

	Title
1	Ghahramani, S. Fundamentals of Probability. Prentice Hall.
2	Sheldon Ross. A First Course in Probability. Pearson.