SDSC4103: DECISION ANALYTICS AND RISK MANAGEMENT

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Decision Analytics and Risk Management

Subject Code
SDSC - School of Data Science
Course Number
4103

Academic Unit
School of Data Science (DS)

College/School
School of Data Science (DS)

Course Duration
One Semester

Credit Units
3

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

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
MA1503 Linear Algebra with Applications, MA1508 Calculus and MA2508 Multi-variable Calculus

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

Decision making, uncertainty and risk are inherent to almost all man-made systems. Effective decisions lead to success and incorrect decisions lead to failures. In this course, students will learn principles and tools for making more beneficial decisions. Students will acquire the knowledge and analytical capability of a principled approach to formulate and solve a decision problem, by accounting for uncertainties in the system or environment and incorporating risk attitudes.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the principles of decision making under risk and uncertainty.	20		x	
2	Formulate real decision making problems with risk and uncertainty as mathematical models.	30	x		
3	Apply appropriate tools and methodologies for solving decision and risk analysis problems.	30	x	x	x
4	Demonstrate reflective practice in an engineering and business context.	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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Delivery of the course will be achieved through a series of formal lectures supported by practical case studies. A series of lectures will introduce basic elements of decision analysis and risk management to help students to appreciate how to address important decisions and manage risk in a formal and scientific manner.	1, 2, 3, 4	39 hours/semester

2	Take-home assignments	Learning through take-home assignments helps students understand techniques of basic methods in as well as their applications in solving decision-making problems.	2, 3, 4	After class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Homework	2, 3, 4	20	
2	Test and quiz	1, 2, 3	20	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

Note: To pass the course, apart from obtaining a minimum of 40% in the overall mark, a student must also obtain a minimum mark of 30% in both continuous assessment and examination components.

Assessment Rubrics (AR)

Assessment Task

Homework

Criterion

Ability to apply the techniques in a diversity of 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

Test and quiz

Criterion
Ability to understand the basic concepts of methods and recognize their applications in solving decision-making 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
Examination

Criterion
2-hour examination

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

Additional Information for AR
The grading is assigned based on students' performance in assessment tasks/activities.

The 2-hour examination (60%), homework (20%) and test and quiz (20%) will be marked numerically and grades will be awarded accordingly.

Part III Other Information

Keyword Syllabus
Modeling decisions and uncertainty, elements of decision problems, decisions under uncertainty, stochastic optimization, risk attitudes and risk measures

Reading List

Compulsory Readings

	Title
1	Lecture notes

Additional Readings

	Title
1	Clemen, Robert T. and Reilly, Terence (2004) Making Hard Decisions with Decision Tools, Duxbury Press. ISBN 978-0-495-01508-6.
2	Marshall, Kneale T. and Oliver, Robert M. (1995) Decision Making and Forecasting: with Emphasis on Model Building and Policy Analysis, McGraw-Hill, ISBN 978-0-070-48027-8.
3	Smith, J.Q. (1988) Decision Analysis: A Bayesian Approach, Chapman and Hall, ISBN 978-0-412-27520-3.
4	Skinner, David (2009) Introduction to Decision Analysis, 3rd ed., Probabilistic Publishing. ISBN 978-0-964-79386-6.
5	Edwards, Ward , Miles, Ralph F., von Winterfeldt, Detlof (2007) Advances in Decision Analysis: From Foundations to Applications. Cambridge University Press, ISBN 978-0-521-68230-5.
6	Powell, Stephen G. and Baker, Kenneth R. (2010) Management Science: The Art of Modeling with Spreadsheets, 3rd ed., John Wiley & Sons, 978-0-470-53067-2.