MS3106: SIMULATION

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Simulation

Subject Code
MS - Department of Decision Analytics and Operations
Course Number
3106

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
CB2200 Business Statistics; or
MS3102 Statistics for Management Decisions; or
MA2506 Probability and Statistics and MS2602 Statistical Inference

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This simulation course is designed to equip students with the essential methodologies and procedures required for the planning, design, implementation, execution, and interpretation of computer simulation experiments. Throughout the course, students will develop the skills necessary to construct and manage simulation experiments of moderate complexity, enhancing their ability to tackle and analyze various business problems through simulation. The course will delve into the theoretical foundations of simulation, practical aspects of model building, and the use of simulation software. By the end of the course, students will be proficient in setting up simulation models, running experiments, and interpreting results to make informed business decisions. This hands-on approach aims to bridge the gap between theoretical knowledge and practical application, providing students with a robust toolkit for analyzing real-world business scenarios through simulation techniques.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Apply Monte Carlo simulation by using tools such as Excel in real life business applications. Generate random varieties for various continuous and discrete distributions.	40		x	
2	Utilize the analytical skills of a discrete-event simulation, including inputting data collection and analysis, model building, model verification and validation, and output analysis.	40		x	
3	Identify and solve real business problems using simulation.	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	Interactive Lecture	Students will learn the concepts on Monte Carlo simulation and discrete event simulations, system modelling techniques. Students listen to lectures and respond to questions after a brief group discussion; They read business cases and related videos that illustrate system modelling and process improvements and demonstrate process improvement techniques.	1, 2, 3	
2	Computer Laboratory	Students will work in groups to apply simulation techniques to problems drawn from operations, revenue management, investment and accounting, etc. in computer laboratory. Students should critically evaluate the solutions and draw their own insights.	1, 2, 3	
3	Peer Discussions	Students will be grouped and work in teams to conduct a case study for a real-world entity by simulation and present their findings in a collaborative document and an in-class presentation	1, 2	
4	Drill and Practice	Students will be required to apply simulation skills in several business problems.	1	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Case Study (Course Project)	1, 2, 3	20	
2	In-Class Exercises	1, 2, 3	10	
3	Individual Assignments	1	10	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Assessment Rubrics (AR)

Assessment Task

Attendance/Class Participation

Excellent (A+, A, A-)

No less than 90% attendance. Actively participates in and facilitates class discussions. Asks thoughtful questions and answers actively

Good (B+, B, B-)

No less than 80% attendance. Participates in class discussions. Asks and answers some questions

Fair (C+, C, C-)

No less than 60% attendance

Marginal (D)

No less than 30% attendance

Failure (F)

Complete Absence

Assessment Task

Individual Assignment & In Class Exercise

Excellent (A+, A, A-)

Strong evidence of knowing how to apply simulation to solving given problems; A+ solutions have to be beyond expectations in terms of solution ideas, originality and results presentation, etc.

Good (B+, B, B-)

Evidence of knowing how to apply simulation software in solving given problems; shows a complete solution procedure, with basically correct results.

Fair (C+, C, C-)

Some evidence of knowing how to apply simulation software in solving given problems; shows basic steps and results.

Marginal (D)

Shows basic steps to try to solve the problems; while the results are not exact or correct; the students at this level are expected to progress without repeating the assignment

Failure (F)

Little evidence of familiarity with the subject matter

Assessment Task

Case Study

Excellent (A+, A, A-)

Strong evidence of original thinking; good organization, capacity to analyse and synthesize; excellent demonstration of taught knowledge or even beyond; strong evidence of extensive knowledge base.

Good (B+, B, B-)

Correct identification and abstraction of a real business problem, together with a complete solution through simulation. A good demonstration of the taught knowledge. Some evidence of critical capacity and analytic ability. Reasonable understanding of issues

Fair (C+, C, C-)

Acceptable identification and abstraction of a real business problem, together with a basic solution based on simulation. Demonstrates a basic grasp of the taught knowledge.

Marginal (D)

Shows a clear attempt to solve the problems along the correct path and sufficient familiarity with the subject matter; but the results may not be satisfactory enough. The students at this level are expected to be able to progress independently afterwards without repeating the case report.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of taught knowledge.

Assessment Task

Examination

Excellent (A+, A, A-)

Strong evidence of original thinking; good organization, capacity to analyse and synthesize; excellent demonstration of taught knowledge; shows the ability to assimilate new knowledge easily; evidence of extensive knowledge base.

Good (B+, B, B-)

Evidence of being able to apply taught knowledge to solve given problems; some evidence of critical capacity and analytic ability; reasonable understanding of issues;

Fair (C+, C, C-)

Able to solve problems with the correct procedure, while the results may not be exact or complete; ability to develop solutions to simple problems in the material.

Marginal (D)

Shows a clear attempt along the correct path, while unable to solve the problems in time; expected to be able to teach self to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature.

Part III Other Information

Keyword Syllabus

Introduction

What is simulation. Intuitive examples. Simulation Applications. Modern simulation technology.

Random Variates Generation
Random number generator. Generating continuous and discrete random variates.

Monte Carlo simulation
Applications in inventory control, project management and financial analysis, etc.

Input Data Collection and Analysis
Collect data necessary for modelling the system and analysing the output. Selecting input probability distributions. Parameter Estimation. Test of goodness-of-fit.

Model building
Building Models using various techniques.

Model Verification and Validation
Verification and validation. Face validity. Validation of model assumptions. Validate input-output transformations.

Output Data Analysis
Output analysis for a single system and comparison of alternative system configurations.

Simulation Workshop
Cases involving production, logistics, and service systems.

Reading List

Compulsory Readings

	Title
1	W. L. Winston, S. C. Albright, M. Broadie (2002). Practical Management Science, 2nd edition, Thomson Learning.
2	D. Kelton W., P. S. Randall, and N. Zupick. (2009) Simulation with Arena. 5th edition, Mc Graw Hill, New York.

Additional Readings

	Title
1	Averill M. Law, W. David Kelton (2000) Simulation modeling and analysis, 3rd edition, Boston: McGraw-Hill.