SDSC4026: SYSTEMS MODELLING AND SIMULATION

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Systems Modelling and Simulation

Subject Code
SDSC - School of Data Science
Course Number
4026

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
MA2506 Probability and Statistics or MA2510 Probability and Statistics

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

Students will engage in various system modelling and simulation techniques and highlight their applications in different areas. They will engage in activities including modelling, design, simulation, planning, verification and validation.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the application background of system modelling and simulation.	10	x		
2	Describe simulation models and simulation studies.	30	x	x	
3	Design statistical analysis including input analysis, random variate generation, output analysis, and variance reduction techniques.	30	x	x	
4	Apply a range of software (e.g., Python) to construct, verify and validate models of the given systems.	30	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	The large class activities include mainly lectures. Each student needs to conduct a project.	1, 2, 3, 4	39 hours/semester
2	LaboratoryWork	Students will engage in the System Modelling and Simulation ideas and approaches with real world examples.	3, 4	In or after class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Project Presentation and Report	1, 2, 3, 4	50	

Continuous Assessment (%)

50

Examination (%)

50

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

Project Presentation and Report

Criterion

Base on project presentation report and program demonstration
i Problem description. (20%)
ii Construction of the model to describe the problem (20%)
iii Demonstration of the constructed model (40%)
iv Discussion on the verification and validation of the model (20%).

Each student needs to outline the capability that system modelling and simulation can do. Also, it needs to describe and apply the mathematical equations for modelling the given problem. Then use software packages to construct, verify and validate the built model.

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

Examination will include multiple choice questions and long questions.

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

Examination will be numerically-marked and grades awarded accordingly.

Part III Other Information

Keyword Syllabus

Statistical models in simulation, random number generation, random variate generation, input and output statistical analysis, model verification and validation, comparing systems and variance reduction.

Reading List

Compulsory Readings

	Title
1	Downey, Allen B. Modeling and Simulation in Python: An Introduction for Scientists and Engineers. No Starch Press, 2023.

Additional Readings

	Title
1	Simulation Modeling and Analysis, Law, A. M., 5th edition, McGraw-Hill Education,New York, 2015.