SYE4036: SYSTEMS MODELLING AND OPTIMIZATION

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Systems Modelling and Optimization

Subject Code
SYE - Systems Engineering
Course Number
4036

Academic Unit
Systems Engineering (SYE)

College/School
College of Engineering (EG)

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
Nil

Equivalent Courses
SEEM4026 Systems Modelling, Optimization and Simulation or
ADSE4036 Manufacturing Systems Modelling and Optimization

Exclusive Courses
Nil

Part II Course Details

Abstract

In this course, students will learn the simulation modelling and optimization techniques of engineering systems, with highlight of their applications in practice. Students will also learn the applications of modelling, design, simulation, verification and validation, planning and optimization.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Outline the significance of system modelling and optimization.	10	x	x	x
2	Apply the mathematical equations for modelling the behaviour of given manufacturing systems.	25	x	x	
3	Use a range of manual processes to model, simulate and optimize the given systems.	25	x	x	x
4	Use a range of commercial software packages to construct, verify and validate models of the given systems, and compare the performance of the systems.	40	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	Large class activities	The large class activities include mainly lectures. Students would also need to conduct a mini-project.	1, 2, 3, 4	39 hours/semester
2	Laboratory Work	The laboratory sessions are to let students get started and work with selected System Modelling and Simulation Software.	1, 2, 3, 4	9 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Mid-term test Base on laboratory report: i Experimental results ii Result analysis and discussion	1, 2, 3, 4	25	-	No
2	Group project / build a mini software or prototype showcasing use of modeling and optimization techniques in systems engineering Each mini project work will be given a problem to solve. Each student needs to outline the capability that system modelling and simulation can do. Students are expected to show: i Development and application of mathematical models ii Demonstration of the constructed model iii Discussion on results.	1, 2, 3, 4	25	-	Yes

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

Students will be assessed by testing their understanding of the concepts learnt in class, textbooks, and their ability to apply subject related knowledge. For a student to pass the course, at least 30% of the maximum mark for both the final examination and continuous assessment components should be obtained.

Assessment Rubrics (AR)

Assessment Task

Mid-term test

Criterion

Students will be assessed by testing their understanding of the concepts learnt in class, textbooks, and their ability to apply subject related knowledge..

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

Groups project

Criterion

Base on project report and program demonstration
i Application of mathematical equations to describe the problem. (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 mini project work will be given a problem to solve. 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 a commercial software package 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
Students will be assessed by testing their understanding of the concepts learnt in class, textbooks, and their ability to apply subject related knowledge.

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
Simulation, queuing models, job scheduling, inventory control, logistics, comparison of system designs, simulation-based optimization, reinforcement learning.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Nil