SYE8107: SPECIAL TOPICS IN COMPUTATIONAL OPTIMIZATION

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Special Topics in Computational Optimization

Subject Code
SYE - Systems Engineering
Course Number
8107

Academic Unit
Systems Engineering (SYE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
1

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
SEEM8107 Special Topics in Computational Optimization (offered until 2021/22)
ADSE8107 Special Topics in Computational Optimization (offered until 2023/24)

Exclusive Courses
Nil

Part II Course Details

Abstract

This course will cover a wide range of topics related to the computational methods encountered in operation research applications. Topics covered in this course will include data structures, design and analysis of algorithms, programming paradigms and languages, development tools and environments, numerical analysis, and matrix computations.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic principles, methodologies and tools in computational optimization.	20		x	
2	Understand basic computational algorithms for optimization.	30			x
3	Understand basic programming tools for implementations.	30			x
4	Learn to use basic programming environments and tools.	20	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	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 and importance of computational optimization.	1, 2, 3, 4	13 hours/semester

2	Mini-project	A typical optimization case study will be given to students to solve. The students are expected to work in teams to tackle the given problem. This learning activity will be mainly student-led but with some structural guidance from the teacher.	1, 2, 3, 4	4 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Mini-Project	1, 2, 3, 4	100	-	No

Continuous Assessment (%)

100

Examination (%)

0

Minimum Continuous Assessment Passing Requirement (%)

30

Assessment Rubrics (AR)

Assessment Task

Mini-Project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Project is completed in groups and is graded by the course leader.

Pass (P)

(P) Pass

Failure (F)

(F) Fail

Assessment Task

Mini-Project (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Project is completed in groups and is graded by the course leader.

Pass (P)

(P) Pass

Failure (F)

(F) Fail

Additional Information for AR

The grading is assigned based on students' performance in assessment tasks/activities.

This is a Pass/Fail course.

Part III Other Information

Keyword Syllabus

- Design optimization
- Gradient-based method
- Heuristic algorithm
- Complexity analysis

Reading List

Compulsory Readings

	Title
1	G.L. Nemhauser and L.A. Wolsey, Integer and Combinatorial Optimization, Wiley, 1999.

Additional Readings

	Title
1	NIL