

SYE2046: NUMERICAL COMPUTATION FOR MANUFACTURING AND SYSTEMS ENGINEERS

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Numerical Computation for Manufacturing and Systems Engineers

Subject Code

SYE - Systems Engineering

Course Number

2046

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

ADSE2046 Numerical Computation for Manufacturing and Systems Engineers

Exclusive Courses

Nil

Part II Course Details

Abstract

In this course, students will learn foundational skills for numerical modelling and computations relevant to manufacturing and systems engineering. Student will learn to convert manufacturing/systems engineering related situations into appropriate engineering models, and to use appropriate numerical techniques to execute/analyze/improve these models.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the building blocks for developing models to represent basic manufacturing/systems engineering related situations.	25	x		
2	Apply analytical methods useful for analyzing these models.	25		x	
3	Convert the analytical methods into appropriate numerical algorithms and equations.	25		x	
4	Construct computer programs (on laptop computers using open-source software platform) to execute and analyze these numerical models, and based on the results, improve/optimize the manufacturing/systems engineering related situations.	25		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	Students will engage in lectures and in-class discussions to attain the key concepts described in CILOs 1-4.	1, 2, 3, 4	39 hours/semester

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments, projects, test Students will be assessed their understanding of concepts and techniques learned in class, reading materials and their ability to apply these concepts, techniques and subject-related knowledge.	1, 2, 3, 4	50	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination should be obtained.

Assessment Rubrics (AR)**Assessment Task**

Coursework

Criterion

tutorial exercises, assignments, project, test

Excellent (A+, A, A-)

Strong evidence of capacity to analyse and synthesize; superior grasp of subject matter.

Good (B+, B, B-)

Evidence of grasp of subject, some evidence of critical capacity and analytic ability.

Fair (C+, C, C-)

Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)

Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills.

Assessment Task

Examination

Criterion

2-hr final examination (either open or closed book based on instructor's discretion)

Excellent (A+, A, A-)

Strong evidence of capacity to analyse and synthesize; superior grasp of subject matter.

Good (B+, B, B-)

Evidence of grasp of subject, some evidence of critical capacity and analytic ability.

Fair (C+, C, C-)

Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)

Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills.

Part III Other Information

Keyword Syllabus

Building blocks for engineering model development; introductory linear programming and optimization; basic statistical models for simulation; elementary introduction to queuing theory; mathematical packages for linear programming and optimization; basic numerical methods for random number generation and simulation; basic python programming.

Reading List**Compulsory Readings**

Title	
1	Lecture notes and slides provided by the instructor.

Additional Readings

Title	
1	Sheldon M. Ross, Simulation, 5th Edition, Academic Press, 2012.
2	Wallace Hopp and Mark Spearman, Factory Physics, 3rd Edition, Waveland Press, 2011.
3	Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 1st Edition, No Starch Press, 2015.
4	Frederick Hillier and Gerald Lieberman, Introduction to Operations Research, 10th Edition, McGraw-Hill, 2015.