ADSE2046: NUMERICAL COMPUTATION FOR MANUFACTURING AND SYSTEMS ENGINEERS

Effective Term
Semester A 2023/24

Part I Course Overview

Course Title
Numerical Computation for Manufacturing and Systems Engineers

Subject Code
ADSE - Advanced Design and System 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
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The course aims to equip students with foundational skills for numerical modelling and computations relevant to manufacturing and systems engineering. It involves converting manufacturing/systems engineering related situations into appropriate engineering models, and uses 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 self-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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Lectures	1, 2, 3, 4	39 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks
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.

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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.