SYE2100: ENGINEERING STATISTICS AND EXPERIMENTATION

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Engineering Statistics and Experimentation

Subject Code
SYE - Systems Engineering
Course Number
2100

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
ADSE2100 Engineering Statistics and Experimentation

Exclusive Courses
Nil

Part II Course Details

Abstract

In this course, students will gain a comprehensive understanding of statistical data analysis methods and develop skills in designing, executing, and analyzing experiments for engineering applications. Through active learning and hands-on experience, students will master the principles and techniques of data analysis and experimentation, including systematic data collection, estimation of models using the collected data, and the interpretation and practical implementation of the results. By the end of the course, students will be equipped with the necessary knowledge and skills to effectively apply these techniques in real-world engineering contexts.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Elaborate on applications of Engineering Statistics and experimentation	25	x		
2	Design, execute experiments and analyse and interpret the experimental results	25			x
3	Understand the basic theory and principles of Engineering Statistics and experimentation	25	x		
4	Apply software to solve case study and engineering statistics projects	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	Weekly lectures. Lectures will be supplemented by: - Discussions - Cases - Small group exercises to facilitate conceptual understanding and introduction to applications.	1, 2, 3, 4	3 hr / week
2	Laboratory	Three labs with Q&A and discussion on Week 6, 9, 12 (tentative). Labs are supplemented by: - Cases - Presentation by students - Small group exercises	1, 2, 3, 4	1 hour / session (3 sessions / semester)

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Group project	1, 2, 3, 4	25	The group project evaluates students' quantitative skills, statistical analysis, and their ability to effectively collaborate with others.	Yes
2	Assignments	1, 2, 3	35	The individual assignments assess student's understanding.	Yes

Continuous Assessment (%)

60

Examination (%)

40

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Assessment Rubrics (AR)

Assessment Task

Group project

Criterion

The group project evaluates students' proficiency in collaboration, and their capability to collect data, analyze data,apply relevant statistical tools, and draw informed conclusions about an experiment.

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

Assignment

Criterion

The assignments assesses students' understanding of statistical engineering and experimental design principles, as well astheir proficiency in analyzing data using mathematical or programming approaches.

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

The examination questions serve to assess student's level of achievement of the intended learning outcomes, with emphasis placed on conceptual understanding and correct application, mostly through numerical calculation, of the various statistical design and analysis of experiments methodologies.

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

The test, assignments, laboratory work and examination will be numerically-marked and grades-awarded accordingly.

Part III Other Information

Keyword Syllabus

- Discrete/Continuous random variables and their probability distributions
- Linear regression model
- Hypothesis testing
- Bayesian data analysis
- Process variability and it relevance to modern statistical engineering
- Engineering statistics

Reading List

Compulsory Readings

	Title
1	Lecture notes and slides

Additional Readings

	Title
1	Wackerly, Dennis, William Mendenhall, and Richard L. Scheaffer, Mathematical statistics with applications, 7th ed., Cengage Learning, 2014.
2	Montgomery, Douglas C., George C. Runger, and Norma F. Hubele. Engineering statistics, 5th ed., Wiley, 2009.
3	Box, Hunter and Hunter, Statistics for Experimenters, 2nd edition Wiley.
4	D.C. Montgomery, Introduction to Statistical Quality Control, 7th ed., Wiley, 2012
5	D.C. Montgomery, Design and Analysis of Experiments, 8th ed., Wiley, 2012
6	Mason, R.L., Gunst, R.F., and Hess, J.L. (2003). Statistical Design and Analysis of Experiments with Applications to Engineering and Science (2nd Edition). New York: John Wiley & Sons