

SYE8203: APPLIED PROBABILITY AND STATISTICS

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Applied Probability and Statistics

Subject Code

SYE - Systems Engineering

Course Number

8203

Academic Unit

Systems Engineering (SYE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

R8 - Research Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

SEEM8203 Applied Probability and Statistics (offered until 2021/22)

ADSE8203 Applied Probability and Statistics (offered until 2023/24)

Exclusive Courses

Nil

Part II Course Details

Abstract

This course provides students with a solid foundation of the concepts, theory, and methods in probability and statistics, including random variable and distributions statistical estimation and inference methods, and multivariate statistics and statistical machine learning. Emphasis will be placed on intuitive and rigorous understanding of the fundamentals of probability statistics and its applications to real-world problems.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Define the various fundamental concepts and principles in probability and statistics.	30	x	x	
2	Derive probability theory and statistical inference formulas and procedures from given assumptions.	20	x	x	
3	Perform probability analysis for real-world problems	25		x	x
4	Perform statistical analysis for the real-world problems.	25	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	Learning through teaching is primarily based on lectures. Mini-lectures and tutorials will be used to facilitate understanding and applications of various concepts and methods.	1, 2, 3, 4	26 hrs/ semester
2	Tutorial Exercises	The homework exercises provide students with the opportunities to familiarize themselves with the methods learnt during the lectures.	1, 2, 3, 4	21 hrs/ semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Midterm exam	1, 2, 3, 4	30	-	No
2	Assignments	1, 2, 3, 4	30	-	No

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**

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

Criterion

Students' ability to apply relevant procedures, draw informed conclusions in probability theory, data analysis, and perform statistical analysis.

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

Midterm exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

It assesses students' understanding of the concepts, theory, and methods.

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

Final exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

It assesses students' understanding of the concepts, theory, and methods.

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

Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Students' ability to apply relevant procedures, draw informed conclusions in probability theory, data analysis, and perform statistical analysis.

Excellent

(A+, A, A-) Excellent

Good

(B+, B) Good

Marginal

(B-, C+, C) Marginal

Failure

(F) Failure

Assessment Task

Midterm exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

It assesses students' understanding of the concepts, theory, and methods.

Excellent

(A+, A, A-) Excellent

Good

(B+, B) Good

Marginal

(B-, C+, C) Marginal

Failure

(F) Failure

Assessment Task

Final exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

It assesses students' understanding of the concepts, theory, and methods.

Excellent

(A+, A, A-) Excellent

Good

(B+, B) Good

Marginal

(B-, C+, C) Marginal

Failure

(F) Failure

Part III Other Information

Keyword Syllabus

- Random variables
- Discrete and continuous random variables
- Point Estimation
- Confidence Intervals
- Hypothesis Testing
- Random processes
- Statistics for machine learning

Reading List

Compulsory Readings

Title	
1	Wasserman, L. (2013). All of statistics: a concise course in statistical inference. Springer Science & Business Media.
2	Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (2021). Probability and statistics for engineers and scientists. Pearson.

Additional Readings

Title	
1	Khuri, A. I. (2003). Advanced calculus with applications in statistics (Vol. 486). John Wiley & Sons.
2	Rosenthal, J. S. (2006). A first look at rigorous probability theory. World Scientific Publishing Co Inc.
3	Blitzstein, J. K., & Hwang, J. (2014). Introduction to probability. CRC Press.
4	Martinez, W. L., & Martinez, A. R. (2007). Computational statistics handbook with MATLAB (Vol. 22). CRC press.
5	Manuel D. Rossetti. (2015). Simulation Modeling and Arena 2nd Edition. Wiley.
6	Gubner, J. A. (2006). Probability and random processes for electrical engineers. Cambridge University Press.