

# MA2510: PROBABILITY AND STATISTICS

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## Effective Term

Semester A 2023/24

## Part I Course Overview

### Course Title

Probability and Statistics

### Subject Code

MA - Mathematics

### Course Number

2510

### Academic Unit

Mathematics (MA)

### College/School

College of Science (SI)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Grade B or above in MA1201 Calculus & Basic Linear Algebra II and subject to approval from MA must be obtained; or  
Grade C- or above in MA1301 Enhanced Calculus & Linear Algebra II; or  
Grade C- or above in both MA1508 Calculus and MA1503 Linear Algebra with Applications

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

MA2172 Applied Statistics for Sciences & Engineering  
MA2177 Engineering Mathematics and Statistics  
MA2506 Probability and Statistics

## Part II Course Details

### Abstract

This course introduces probability theory and statistical inference. It will help students learn the theoretical basis and practical applications of probability distributions, and understand the theory of statistical inference as developed from the basis of probability. It trains students in thinking and analyzing problems from a probabilistic and statistical point of view.

### Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	explain concepts at high levels and implement basic operations in probability and statistics.	15	x		x
2	apply the methods of hypothesis testing and parametric estimation for some statistical problems.	25		x	
3	create and formulate mathematical models using probability and statistics.	40		x	
4	apply statistical and computational methods to a range of problems in science and engineering involving probability and statistics.	20	x	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 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	Learning through teaching is primarily based on lectures.	1, 2, 3, 4	40 hours in total
2	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	1	4 hours
3	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	2	4 hours

4	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	3	2 hours
5	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	4	2 hours
6	Assignments	Learning through take-home assignments helps students understand the theoretical basis and identify practical applications of probability and statistics, and develop the ability of analyzing problems from a probabilistic and statistical point of view.	1, 2, 3, 4	after-class
7	Online applications	Learning through online examples for applications helps students design and construct probabilistic and statistical models, and apply to some problems in science and engineering.	3, 4	after-class
8	Math Help Centre	Learning activities in Math Help Centre provides students extra help.	1, 2	after-class

**Assessment Tasks / Activities (ATs)**

	<b>ATs</b>	<b>CILO No.</b>	<b>Weighting (%)</b>	<b>Remarks</b>
1	Test	1, 3, 4	20	Questions are designed for the part of probability theory to see how well the students have learned the fundamental theory and recognized the applications of probability.
2	Hand-in assignments	1, 2, 3, 4	10	These are skills-based assessment to enable students to demonstrate the basic concepts and fundamental theory of probability and statistics, and identify the applications.

**Continuous Assessment (%)**

30

**Examination (%)**

70

**Examination Duration (Hours)**

3

**Additional Information for ATs**

30% Coursework

70% Examination (Duration: 3 hours, at the end of the semester)

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

**Assessment Rubrics (AR)**

**Assessment Task**

1. Test

**Criterion**

ABILITY to APPLY and EXPLAIN the basic concepts and methodology of probability and statistics

**Excellent (A+, A, A-)**

High

Demonstrates an excellent understanding of the concepts of probability and statistics, and can always apply this understanding

**Good (B+, B, B-)**

Significant

Demonstrates a good understanding of the concepts of probability and statistics, and can usually apply this understanding

**Fair (C+, C, C-)**

Moderate

Demonstrates a partial understanding of the concepts of probability and statistics, and can often apply this understanding

**Marginal (D)**

Basic

Demonstrates a limited understanding of the concepts of probability and statistics, and can sometimes apply this understanding

**Failure (F)**

Not even reaching marginal levels

Demonstrates little understanding of the concepts of probability and statistics, and can rarely apply this understanding

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**Assessment Task**

2. Hand-in assignments

**Criterion**

CAPACITY for LEARNING to understand the principles of probability and statistics

**Excellent (A+, A, A-)**

High

Demonstrates an excellent understanding of the concepts and tools of probability and statistics, and can always apply it to solve explicit problems

**Good (B+, B, B-)**

Significant

Demonstrates a good understanding of the concepts and tools of probability and statistics, and can usually apply it to solve explicit problems

**Fair (C+, C, C-)**

Moderate

Demonstrates a partial understanding of the concepts and tools of probability and statistics, and can often apply it to solve explicit problems

**Marginal (D)**

Basic

Demonstrates a limited understanding of the concepts and tools of probability and statistics, and can sometimes apply it to solve explicit problems

**Failure (F)**

Not even reaching marginal levels

Demonstrates little understanding of the concepts and tools of probability and statistics, and can sometimes apply it to solve explicit problems

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**Assessment Task**

4. Examination

**Criterion**

ABILITY to DEVELOP models through probability and statistics and SOLVE problems with different methods

**Excellent (A+, A, A-)**

High

Demonstrates an excellent understanding of probability and statistics, and can always apply it to analyze concrete situations

**Good (B+, B, B-)**

Significant

Demonstrates a good understanding of probability and statistics, and can usually apply it to analyze concrete situations

**Fair (C+, C, C-)**

Moderate

Demonstrates a partial understanding of probability and statistics, and can often apply it to analyze concrete situations

**Marginal (D)**

Basic

Demonstrates a limited understanding of probability and statistics, and can sometimes apply it to analyze concrete situations

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**Part III Other Information**

Keyword Syllabus

Probability. Sample Space. Discrete and Continuous Random Variables. Discrete and Continuous Probability Distributions. Central Limit Theorem. Chebyshev's Theorem. Mathematical Expectation and Variances. Moment Generating Functions. Estimation of Parameters. Hypothesis Testing for one and two samples.

### Reading List

#### Compulsory Readings

Title	
1	Probability and Statistics for Engineers and Scientists, by Walpole, Myers, Myers and Ye, 8th Ed., Pearson International Edition, 2007.

#### Additional Readings

Title	
1	Probability and Statistics for Engineers and Scientists, by Devore, 8th Ed., Cengage International Edition, 2012.