Course Code	Course name	L	T	P	C
MATH2058	Applied Statistics and Probability	3	0	0	3

Total Units to be Covered: 05		Total Contact Hours: 45	
Prerequisite(s):	Basic Mathematics II - MATH1066	Syllabus version: 1.0	

Course Objectives

By the end of this course, students should have a strong foundational understanding of Types of Data and Data Condensation, probability, and applied statistics. They should be able to apply these mathematical concepts to solve problems in computer science, analyse data, and make informed decisions. The course aims to equip students with the mathematical skills and reasoning abilities necessary for their further studies and future careers in the field of computer science.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Prepare the data and select appropriate methods to represent data graphically and derive the basic descriptive statistics of the data.

CO2. Apply statistical methods to describe and interpret data, including measures of central tendency, dispersion, and hypothesis testing.

CO3. Identify appropriate probability distributions, discrete / continuous, in problems with uncertainty and compute quantities of interest.

CO4. Analyse and solve problems related to data analysis, machine learning, and computer network performance using probability concepts.

CO-PO Mapping

Program Outcomes / Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	1	1	-	-	-	-	-	-	-	-	-	-
Average	2	1	.25	-	-	-	-	-	-	-	-	-	-

1 – Weakly Mapped (Low)   **2 – Moderately Mapped (Medium)**
3 – Strongly Mapped (High)   **"_" means there is no correlation**

Syllabus

Unit I: Motivation   **1 Lecture Hours**

Application of Probability and Statistics in Epidemiology; Generalized Linear Models; Multivariate Statistics; Survival analysis and Bootstrapping, Data Analysis and Machine Learning.

Unit II: Types of Data and Data Condensation   **9 Lecture Hours**

Concept of population and sample. Different types of scales: nominal, ordinal, interval, and ratio. Types of data: Qualitative and quantitative data; Time series data and cross section data, discrete and continuous data. Tabulation & Diagrammatic representation using bar diagrams, and pie chart. Graphical representation of frequency distribution by Histogram, frequency polygon, Stem and leaf diagram and Cumulative frequency curve. Recap of Unit I.

Unit III: Elements of Statistics   **10 Lecture Hours**

Measure of central tendency: mean, median, mode, quartiles, and quantiles. Measure of dispersion: mean deviation, interquartile range, standard deviation, variance and combined variance, raw moments and central moments and relations between them. Concept of Skewness and Kurtosis: Measures of Skewness: Karl Pearson's, Bowley's

and Coefficient of skewness based on moments. Measure of Kurtosis. Recap of Unit II.

Unit IV: Probability and Distributions   15 Lecture Hours

Sample space, Probability axioms, Random experiments, events, probability, independent events, exclusive and exhaustive events, conditional probability, and Bayes' theorem.   Real random variables (discrete and continuous), Cumulative distribution function, probability mass/density functions. Bernoulli, Binomial, and Poisson distribution. Uniform, Exponential, Gamma, and Normal distribution. Mathematical expectation, moments, moment generating function, characteristic function. Recap of Unit III.

Unit V: Jointly Distributed Random Variables   10 Lecture Hours

Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables. Covariance, Correlation coefficient, Regression line, Limit theorems: Law of large numbers and Central limit theorem, Breakdown of CLT.

Total lecture Hours 45

References*

Textbooks	1. Ross, S. M. (2020). A first course in probability. Pearson. 2. Trivedi, K. S. (2008). Probability & statistics with reliability, queuing and computer science applications. John Wiley & Sons. Chapters 1 to 5. 3. Miller I. and Miller M. (2006), John E. Freund-Mathematical Statistics with Application, 7th Ed., Pearson Education, Asia.
Reference books	1. Ross S. (2007), Introduction to Probability Model, 9th Ed., Academic Press, Indian Reprint.
Web Resources	
Journals	
MOOCs, online courses	

Modes of Evaluation: Coursera Quiz + Classroom Participation + Course Quiz

Examination Scheme

Components	IA	MID SEM	End Sem	Total
Weightage (%)	50	20	30	100