UIT University

DEPARTMENT OF ENGINEERING TECHNOLOGY

(Spring 2025)

Course Information

Course Title: Probability and Statistics			**Code:** NST123
Department: Engineering Technology			
Program: Bachelor of Engineering Technology (Software)	**Semester:** IV	**Batch:** FA23	**Credit Hours: 3+0** **Lecture: 48** **Practical:** Nil
Knowledge Area (as per HEC/NTC curriculum template)	Quantitative Reasoning		

1. Course description and objectives:

This course teaches basic concepts and engineering applications of statistics and probability theory. This course covers the role of statistics in engineering which includes, probability distributions, random sampling and data description, point estimation of parameters, statistical intervals for a single sample, and tests of hypotheses for a single sample.

2. Course Learning Outcomes (CLOs):

CLO No.	*CLO Description*	*Domain and Taxonomy level*	*PLO mapped (i to xii)*	*Level of emphasis of the PLO (1=High; 2=Medium; 3=Low)*
1.	Understand the basic concepts of Statistics and Probability and their need in engineering.	**C2**	ii	2
2.	Describe the properties and classifications of probability density functions, regression analysis and interval estimation.	**C2**	ii	2
3.	Apply different probability and statistics techniques in engineering technology problems.	**C3**	i	2

Note:

C → Cognitive, P → Psychomotor, A → Affective domains and 'n' is the taxonomy level.
It is strongly suggested that one CLO should be mapped to one PLO and one domain only.

Teaching Plan

3. Weekly Lecture Breakdown

Week #	*Topic(s) to be covered*	*CLO #*
1	Introduction to Statistics and Data Analysis; classification and presentation of data.	CLO 1
2	Tabulation, frequency distribution and graphical representation of data; simple and multiple bar diagrams, pie and sectorial diagrams, histogram, frequency polygon and curves and their types	CLO 1
3	Measures of central tendency; calculation of mean, median, mode and quartiles of various types with related problems	CLO 1
4	Measures of dispersion; calculation of range, moments, skewness and kurtosis, quartile deviation, mean deviation, standard deviation, variance and its coefficient with related problems	CLO 1
5	Introduction to Probability; experiment, sample space, probability of an event, counting methods for sample points, sum and product rules of probability with related problems	CLO 1
6	Conditional probability; dependent and independent events, Bayes' rule with related problems	CLO 1
7	Concept of random variables and their types, probability distribution and distribution function of discrete random variable with related problems	CLO 2
8	Probability distribution and distribution function of continuous random variable, mean and variance of random variables with related problems	CLO 2
Midterm Examination		
9	Probability distributions; Discrete and Continuous probability distributions with related problems	CLO 2
10	Probability distributions; Binomial and Poisson probability distributions with related problems	CLO 2
11	Probability distributions; Uniform, Exponential and Normal probability distributions with related problems	CLO 3
12	Introduction to Sampling and Sampling Distributions; objects of sampling, sampling with and without replacement, sampling distribution of mean and central limit theorem with related problems	CLO 3
13	Introduction to testing of hypothesis; types of estimates, concept of confidence interval, single sample and 1 & 2 sample tests of hypothesis with related problems	CLO 3
14	Linear regression and correlation; scatter diagrams, regression lines, correlation and its coefficient with related problems	CLO 3
15	Curve Fitting; fitting of 1st and 2nd degree curves	CLO 3
16	Curve Fitting; fitting of exponential curves and principle of least square with related problems	CLO 3

4. Syllabus and Books:

Statistics: Introduction, Types of data & variables, presentation to data, object, classifications, Tabulation, Frequency distribution, Graphical representation, Simple & Multiple Bar diagrams, Sartorial& Pie-Diagram, Histogram, Frequency, Polygon, Frequency Curves & their types.
Measures of Central Tendency and Dispersion: Statistics Averages, Median Mode, Quartiles, Range, Moments, Skew ness & Kurtosis, Quartile Deviation, Mean Deviation, Standard Deviation, Variance & its coefficient, Practical Significance in related problems.
Curve Fitting: Fitting of a first- and Second-degree curve, fitting of exponential and logarithmic curves, related problems. Principle of least squares, second order Statistics & Time series not in bit detail. Simple Regression and Correlation Scatter diagrams, Correlation & its Coefficient, Regression lines, Rank Correlation & its Coefficient, Probable Error (P.E), related problems.
Sampling and Sampling Distributions: Population, Parameter & Statistic, Objects of sampling, Sampling distribution of Mean, Standard errors, Sampling & Non- Sampling Errors, Random Sampling, Sampling with & without replacement, Sequential Sampling, Central limit theorem with practical significance in related problems.
Statistical Inference and Testing of Hypothesis: Estimation, Types of Estimates, Confidence interval, Tests of hypothesis, Chai square one tails & two tails tests. Application in related problems.
Probability: Basic concepts, Permutation & Combination, Definitions of probability, Laws of Probability. Conditional probability, Bayes' Rule. Related problems in practical significance.
Random Variables: Discrete & Continuous random variables, Random Sequences and transformations. Probability distribution, Probability density function, Distribution function, Mathematical expectations, Moment Generating Function (MGF), Markov random walks chain/ related problems.

Probability Distributions: Discrete probability distributions, Binomial Poisson, Hyper geometric & Negative binomial distributions, Continuous probability distribution, Uniform, Exponential & Normal distributions & their practical significance.

Text books:

- Leon-Garcia, "Probability and Random Processes for Electrical Engineering", Pearson Education, 2nd Edition, 1994.
- Sheldon Ross, "A First Course in Probability", Pearson Education, 6th Edition, 2002.

Reference Books:

- Douglas C. Montgomery, Applied Statistics and Probability for Engineers, Latest Edition.

5. Percentage of theoretical background, problems analysis and solution design

Elements covered in the course	Percentage of full course coverage
Theoretical background	40%
Problem analysis	60%
Solution design	0%

6. Teaching and learning methods:

a. Lectures
b. Class discussion
c. Presentation (Optional)
d. Homework/Assignment

7. Student assessment methods:

a. Quiz
b. Assignment
c. Exams (Theory)
d. Presentation/Activities (Optional)

8. Assessment schedule:

a.	Quiz	throughout the semester	
b.	Assignment	throughout the semester	
c.	Exams		
d.	Midterm exam	Week	9
e.	Final theory exam	Week	18
f.	Presentation/ Activities	Week	15,16 (when required)

9. **Weighting of assessments:**

Theory:

a.	Quizzes/Activities	10 Marks
b.	Assignments/Presentation	15 Marks
c.	Midterm examination	20 Marks
d.	Final term examination	50 Marks
e.	Attendance	05 Marks
	Theory Total	100 Marks

10. Facilities required for teaching and learning

a. Classroom with white board
b. Computer Usage/Multimedia
c. Online board + online ppt writing (Optional)
d. YouTube (Optional)

S. No.	Course group Leader	Theory/Lab	Signature
1	Engr. Rehan Ahmed Khan	Theory only	

Recommended by the department coordinator	Verified by the department HoD
Endorsed By the Dean of the Faculty	**Approved by Provost**