

COURSE CODE: MATH-361
COURSE NAME: PROBABILITY AND STATISTICS

CREDIT HOURS: Theory = 03
Practical = 00
Total = 03

CONTACT HOURS: Theory = 48
Practical = 00
Total = 48

PREREQUISITE: MATH-101 (It is a Pre-requisite course for GIE-205 Spatial Data Analysis and CS-471 Machine Learning)

MODE OF TEACHING:

Instruction: Three hours of lecture per week 100%

COURSE DESCRIPTION:

The course offers the basic understanding of Statistics and Probability. This course covers the use of statistical analysis in civil engineering problems and gives a detailed review of descriptive statistics and probability, detailed study of important distributions such as binomial, exponential, Poisson, normal distributions etc. and their applications in civil engineering.

COURSE OBJECTIVES:

The objectives of this course are to introduce the basic terms of statistics and probability to Civil Engineering students. Explain the basic concepts of descriptive statistics probability, probability distributions, and inferential statistics.

RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):

The course is designed so that students will achieve the PLO/s:

- | | | | | | |
|---|----------------------------------|-------------------------------------|----|---|--------------------------|
| 1 | Engineering Knowledge: | <input type="checkbox"/> | 7 | Ethics: | <input type="checkbox"/> |
| 2 | Problem Analysis: | <input checked="" type="checkbox"/> | 8 | Individual and Collaborative Team Work: | <input type="checkbox"/> |
| 3 | Design/Development of Solutions: | <input type="checkbox"/> | 9 | Communication: | <input type="checkbox"/> |
| 4 | Investigation: | <input type="checkbox"/> | 10 | Project Management: | <input type="checkbox"/> |
| 5 | Tool Usage: | <input type="checkbox"/> | 11 | Lifelong Learning: | <input type="checkbox"/> |
| 6 | The Engineer and Society: | <input type="checkbox"/> | | | |

COURSE LEARNING OUTCOMES (CLOs):

Upon successful completion of the course, students will be able to:

| No. | CLO | Domain | Taxonomy Level | PLO |
|-----|--|-----------|----------------|-----|
| 1 | Apply the concepts of statistics to explain experimental data. | Cognitive | 3 | 2 |
| 2 | Apply the concepts of probability and statistics for testing of hypothesis | Cognitive | 3 | 2 |

PRACTICAL APPLICATIONS:

- Experimental studies in Structural Analysis
- Experimental studies in Water resource management

TOPICS COVERED:

Theory:

| Week | Topic |
|-------|---|
| 1 | Introduction to descriptive and inferential statistics, measurement of scales, Collection of data, Classification, Distribution, Graphical representation. |
| 2 | Histograms, frequency polygons, types of frequency curves, Cumulative frequencies, Relative Frequencies. |
| 3 | Histograms for the unequal class widths, Measure of central tendency, Arithmetic mean, Geometric mean, Harmonic mean, relation between A.M, G.M and H.M. |
| 4 | Median, quartiles, deciles, percentiles, mode. Root mean square, Relation between mean median and the mode, Merits and Demerits of averages. |
| 5-6 | Measure of Variability, variance, standard deviation, coefficient of variation, range; inter quartile range, coefficient of Quartile deviation, Mean deviation, Coefficient of mean deviation, moments, skewness, and kurtosis. |
| 7 | Introduction to probability, review of set theory, sample space, events, axioms of probability. |
| 8 | Permutation and combination, conditional probability, dependent and independent events |
| 9 | Distribution function, discrete random variable, and its probability distribution. |
| 10 | Continuous random variable and its probability density function. |
| 11 | Mathematical expectation of a random variable, moment generating functions |
| 12 | Binomial distribution and its applications, Poisson distribution and its application. |
| 13 | Uniform, exponential, and normal distributions |
| 14 | Binomial distribution approximation to Normal distribution |
| 15-16 | Student-t test, Z-test, Testing of hypothesis |
| 17-18 | ESE |

TEXT AND MATERIAL:**Textbook (s):**

- a. Introduction to Probability and Statistics for Engineers and Scientists by Sheldon M. Ross.

References Material:

- a. Calculus with Analytic Geometry by Thomas and Finny.
- b. Probability and Statistics by Murray R.Spiegel, John J.Schiller, A.V.Srinivasan, Mike Levan.

ASSESSMENT SYSTEM:**1. CLOs Assessment**

| Cognitive | Psychomotor | Affective |
|------------------|--------------------|------------------|
| Spreadsheet | - | - |

2. Relative Grading

| Theoretical / Instruction | | | 100% |
|----------------------------------|------------------------------|--|-------------|
| | <i>Assignments 10%</i> | | |
| | <i>Quizzes 10%</i> | | |
| | <i>Mid Semester Exam 30%</i> | | |
| | <i>End Semester Exam 50%</i> | | |
| Total | | | 100% |