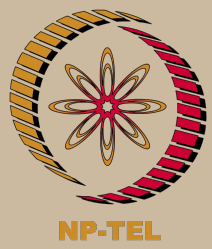
Probability Methods in Civil Engineering - Web course



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Civil Engineering

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COURSE OUTLINE

Given the probabilistic elements that are to be dealt with as part of civil engineering curriculum it is useful to undergo through this proposed course.

Introduction of this course comprises several examples on various types of civil engineering problems where the probability and statistics related concepts are used.

In the initial few lectures, basic concepts on probability and random variables will also be covered in detail.

Various discrete and continuous probability distributions that are commonly used in the fields of Structural engineering, Environmental engineering, Geotechnical engineering, Water resource engineering, and Transportation engineering will be presented in detail.

Topics such as statistics and their distributions will also be covered with relevant examples, which will be useful when dealing with the experimental/field data, which is a common thing in many branches of civil engineering.

This course also covers hypothesis testing which is equally important when some conclusions are to be drawn from the experimental/field data.

Contents:

Introduction; Random events;

Random variables: discrete and continuous random variables;

Functions of random variables: Single random variables, multiple random variables;

Probability distributions: discrete distributions, continuous distributions; Random samples and statistics; statistical distributions; Parameter estimation; Hypothesis testing.

COURSE DETAIL

Sl.No.	Topic	No. of Hours
1.	**Introduction:** Role of probability and statistics in civil engineering.	1
2.	**Random events:** Definition of basic random events; Application of set theory in definition of composite event operations. Probability of events and definition of probability axioms; Solution of real life examples from civil engineering.	6

3.	**Random Variables:** Definition of random variables - discrete and continuous; Probability definitions - PMF, PDF, CDF; Moments and expectations.	6
4.	**Functions of random Variables:** Definition of probability distributions of functions of single and multiple random variables - exact methods and approximate methods; Moments and expectations of functions - direct and indirect methods.	6
5.	**Probability Distributions:** Discrete distributions - binomial distribution, Poisson's distribution; Continuous distributions - exponential distribution,gamma distribution; Central limit theorem; Normal and lognormal distributions; Extreme value distributions.	7
6.	**Random samples and statistics:** Examples on various civil engineering problems.	1
7.	**Sampling distributions:** Chi-square distribution, t - distribution, F distribution.	4
8.	**Parameter estimation:** Point estimation, confidence interval estimation.	4
9.	**Hypothesis Testing:** Tests of hypotheses on the mean and variance.	4

References:

1. Ang, A. H-S., and Tang, W., H. "Probability concepts in engineering: Emphasis on applications in civil and environmental engineering." Wiley.
2. Kottegoda, N. T., and Rosso, R. "Applied Statistics for Civil and Environmental Engineers." Wiley.
3. Ross, S. "A first course on probability." Prentice Hall.
4. Johnson, R. A., and Gupta, C. B. "Miller and Freund's Probability and Statistics for Engineers." Pearson Education.