Probability Methods in Civil Engineering

SWAYAM Prabha Course Code – C23

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DEPARTMENT	Civil Department
INSTITUTE	Indian Institute of Technology, Kharagpur
Course Outline	Concept of probability and statistics is very important to solve various civil engineering problems. In this video course, basic probability concept and different probabilistic models will be discussed to educate the audience about the vital role of such methods in civil engineering. Concept and definition of random variables and different functions o f random variables will be covered in the initial part of the course. Both univariate and multivariate functions will be discussed. Concept of joint, marginal and conditional probability distributions, moments, expectations, correlation will also be discussed. Afterwards, focus is given to commonly used probability distribution functions in civil engineering. Both discrete (binomial distribution, poisson's distribution) and continuous distribution functions (normal, lognormal, exponential distribution, gamma distribution) will be discussed. Concept of central limit theorem will also be also introduced. The course will be ended with the discussion of statistics and sampling. In this part, goodness of fit tests, regression and correlation analyses, estimation o f distribution parameters from statistics, hypothesis testing and their significance and Bayesian updating of distributions will be discussed. Each topic is discussed with reference to different application problems and their solutions. The course is mainly designed for the post graduate students. However, general concept and basic applications may be helpful

	to under graduate students also.

COURSE DETAILS

S. No	Module ID/ Lecture ID	Lecture Title/Topic
1	L1	Introduction - Role of Probability in Civil Engineering
2	L2	Random Events and Probability Concept
3	L3	Set Theory and Set Operations
4	L4	Axioms of Probability
5	L5	Probability of Events
6	L6	Concept and Defination of Random Variables
7	L7	Probability Distribution of Random Variables
8	L8	CDF and Descriptors of Random Variables
9	L9	Further Descriptors of Random Variables
10	L10	Discrete Probability Distribution
11	L11	Probability Distribution of Continuous RVs
12	L12	Probability Distribution of Continuous RVs (Contd...1)
13	L13	Probability Distribution of Continuous RVs (Contd...2)
14	L14	Functions of Single Random Variables
15	L15	Functions of Random Variables - Different Methods
16	L16	Functions of Random Variables - Different Methods (Contd.)
17	L17	Expectation and Moments of Functions of RV
18	L18	Expectation and Moments of Functions of RV (Contd.)
19	L19	Joint Probability Distribution

20	L20	Marginal Probability Distribution
21	L21	Conditional Probability Distribution
22	L22	Conditional Probability Distribution (Contd.)
23	L23	Properties of Multiple Random Variables
24	L24	Properties of Multiple Random Variables (Contd.)
25	L25	MGF of Multivariate RVs and Multivariate Probability Distributions
26	L26	Multivariate Distribution and Functions of Multiple Random Variables
27	L27	Functions of Multiple Random Variables (Contd...1)
28	L28	Functions of Multiple Random Variables (Contd...2)
29	L29	Introduction to Copulas
30	L30	Introduction to Copulas (Contd.)
31	L31	Probability Models using Normal Distribution
32	L32	Probability Models using Log Normal and Exponential Distribution
33	L33	Probability Models using Gamma and Extreme Value Distribution
34	L34	Probability Models using Discrete Probability Distributions
35	L35	Sampling Distribution and Parameter Estimation
36	L36	Sampling Distribution and Parameter Estimation (Contd.)
37	L37	Hypothesis Testing
38	L38	Goodness - of - fit tests
39	L39	Regression Analyses and Correlation
40	L40	Regression Analyses and Correlation (Contd.)

References if Any: