**Course syllabus**

**Department of Civil Engineering, Indian Institute of Technology Madras**

**CE7720 – STRUCTURAL RELAIBILITY**

**Credit Distribution:** C:9 L:3 T:0 P:0 E:0 O:6 TH:0

**Course Type:** Theory

**Description:** - To provide fundamental concept of structural safety of both new and existing structures. - To develop an understanding of the concept of structural reliability and its definitions in the context of structural engineering

**CourseContent**:1. Probability Theory: Random variables and distributions, Joint random variables, Moments and Expectation, probabilistic models for loads and resistance parameters 2. Structural Reliability Analysis: Limit states, Probability of failure, Reliability index, Performance functions, Monte Carlo methods, Latin hypercube Sampling, Importance sampling, Multiple safety factor formats, Level II and III Reliability Methods 3. System Reliability: Elements and Systems, Series and parallel systems, Systems with equally and unequally correlated elements 4. Reliability Based Structural Design: Design codes, Partial safety factors, Load combinations, Application to structures, Sensitivity analysis 5. Advanced Topics: Time-variant reliability, Stochastic differential equations, Stochastic finite element analysis, Bayesian Updating,

**Textbooks**:

1. Madsen, H.O., Krenk S. and Lind, N.C., Methods of Structural Safety, Prentice Hall, 1986.

2. Throft-Christensen, P. and Murotsu, Y., Application of Structural Systems Reliability Theory, Springer Verlag, 1986.

3. Melchers, R.E., Structural Reliability: Analysis and Prediction, 2nd Ed., John Wiley, 1999.

4. Ang A.H.S. and Tang, W.H., Probability Concepts in Engineering and Design, Vols. 1 and 2, John Wiley, 1975.

5. Leporati, E., The Assessment of Structural Safety, Research Studies Press, 1979.

6. Haldar, A. and Mahadevan, S., Reliability Assessment using Stochastic Finite Element Analysis, John Wiley and Sons, 2000.

7. Haldar, A., and Mahadevan, S., Probability, Reliability and Statistical Methods in Engineering Design. John Wiley and Sons, 2000.

8. Ranganathan, R., Structural Reliability Analysis and Design, Jaico Publishing House, 1999.

**Reference Books**: NIL

**Prerequisite**: NIL

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