1.	Title of the course	Random Vibrations and Structural Reliability
2.	Course number	CE531L
3.	Structure of credits	3-0-0-3
4.	Offered to	PG
5.	New course/modification to	Modification To CE5030/8
6.	To be offered by	Department of Civil and Environmental Engineering
7.	To take effect from	July 2022
8.	Prerequisite	CoT
9.	**Course Objective(s):** To understand the role of uncertainty and learn the methods to quantify the same in structural engineering. To introduce the concept of failure and methods to quantify it. To formulate the problem of structural reliability, understand a few solution strategies and also to appreciate the challenges in determining low probability failures	
10.	**Course Content:** Review of probability; Random variables - moments, probability density function and distribution functions, Central limit theorem; Random processes - stationary and nonstationary random processes, ergodicity, power spectral density, Weiner Kinchine relation, Gaussian and Markov processes; Random vibrations - Review of results in dynamics, input-output relations in time and frequency domain, Markov vector approach – Fokker Plank Kolmogorov (FPK) equation, failure - level crossing, first passage time, peak distributions, fatigue; Reliability analysis – performance function and limit states, probability based design, systems in series and parallel, first and second order reliability method (FORM and SORM), response surface methods, adaptive and importance sampling methods, subset simulation, component and system reliability.	
11.	**Textbook(s):** 1. Lin Y K and Cai G Q, *Probabilistic Structural Dynamics: Advanced Theory and Applications*, McGraw-Hill (2004). 2. Melchers R E and Beck A T, Structural Reliability Analysis and Prediction, John Wiley & Sons (2018).	
12.	**Reference(s):** 1. Ang A H S and Tang W H, *Probability Concepts in Engineering Planning and Design - Volume II : Decision, Risk and Reliability*, John Wiley & Sons (1984). 2. Nigam N C,Introduction to Random Vibrations, MIT Press (1983). 3. Lutes L D and Sarkani S, *Random Vibrations: Analysis of Structural and Mechanical Systems*, Elsevier (2004).	