STRUCTURAL DYNAMICS
(Professional Core)

Course Code: 19CE2202

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The students will be able to:

CO 1. Describe the basic terminology involved in structural dynamics and free vibration concepts.

CO 2. Describe the cause and response of SDOF force vibration.

CO 3. Analyze the response for pulse excitation .

CO 4. Analyze the behavior for multi-degree of freedom system.

CO 5. Analyze the beams for dynamic loads.

UNIT –I:
BASICS OF STRUCTURAL DYNAMICS AND FREE VIBRATION   (10-Lectures)

Types of Analysis/Static and Dynamic load; Degrees of Freedom; Dynamic Equilibrium Equation ; Solution of Equilibrium Equation; Undamped free Vibration and Solution, Natural Period/Frequency; Energy in Free Vibration; Damped Free Vibration; Types of damping ; Logarithmic decrement.
LO1: Learn basic terminologies in structural dynamics
LO2: Derive the response to SDOF free vibration

UNIT –II:
FORCED VIBRATION OF SINGLE DEGREE OF FREEDOM   (10-Lectures)

Undamped Forced vibration ; Amplitude & Phase Angle ; Dynamic amplification factor for deflection (Rd); Damped Forced vibration ; Relationship between Rd, Rv and Ra. Resonant frequency and Half power band width.
LO1: Learn the concept of forced vibration and its response for SDOF
LO2: Derive equations of damping ratio

UNIT –III:
RESPONSE TO ARBITRARY MOTIONS (10-Lectures)

Response to Unit Impulse; Response to Arbitrary Force (Duhamel's Integral); Response to Step and Ramp Forces; Response to Rectangular Pulse, Half Sinusoidal wave
LO1: Understand the concept of pulse forces.
LO2: Derive response to pulse forces during arbitrary motion.

UNIT –IV:
MULTI-DEGREE OF FREEDOM SYSTEMS (10-Lectures)

Equation of Motion for MDOF System; Response of Multi-Degree of Freedom Systems A.K.Natural Frequencies and mode Shapes; Modal Orthogonality; Approximate Method for finding Natural frequency; Response Spectrum Analysis
LO1: Understand the behavior of MDOF and its equation of motion
LO2: Derive response to MDOF and Response spectrum analysis

UNIT –V:
DYNAMIC RESPONSE OF CONTINUOUS SYSTEMS
(10-Lectures)
Vibration of Continuous systems ; Shear behavior and bending behavior of beams; Generalized SDOF
GROUND MOTION
Base Excitation, response to base excitation, Transmissibility.
LO1: Understand the concept of continuous system, mass distribution
LO2: Derive modal frequency for various modes for beams
LO3: understand the response to base excitation

Test Books
1. Chopra A. K., ‒Dynamics of Structures‖, 3 rd Edition, Pearson edition, 2007.
2. Mario Paz, William Leigh., ‒Structural Dynamics: Theory and Computation‖, 5th edition, Springer. 2003.

References
1. Raymond W. Clough, Joseph Penzien, ‒Dynamics of Structures‖, McGraw-Hill Book Company.
2. W. Weaver, Jr., S. P. Timoshenko, D. H. Young. ‒Vibration Problems in Engineering‖, 4th Edition. 2010.