K L UNIVERSITY
STRUCTURAL DYNAMICS (09 – CE E33)

SYLLABUS

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UNIT – 1   Equation of Motions, Problem Statement, Solution Methods of Single Degree of Freedom Systems (SDOF): Basic concepts of structural dynamics; single degree of freedom system, force displacement relationship, damping force, equation of motion, mass-spring-damper system, methods of solution of differential equation.
Free Vibration (SDOF): Undamped free vibration viscously damped free vibration, energy in free vibration.

UNIT – 2   Response to Harmonic and Periodic Excitations (SDOF): Harmonic vibration of undamped systems, Harmonic vibration with viscous damping, response to vibration generator, natural frequency and damping from harmonic test, force transmission and vibration isolation, vibration measuring instruments, and. Response to periodic force.

UNIT – 3   Response to Arbitrary, Step and Pulse Excitations (SDOF): Response to unit impulse, response to arbitrary force, step force, ramp force, response to pulse excitations, solution methods, effects of viscous damping.
Numerical Evaluation of Dynamic Response (SDOF): Time step methods, methods based on interpolation of excitation, central difference method, new mark's method, stability and computational error,and analysis of nonlinear response by newmark's method.

UNIT – 4   Earthquake Response to Linear Systems (SDOF)
Earthquake excitation, equation of motion, response quantities, response history, response spectrum concept, deformation, pseudo-velocity and pseudo acceleration response spectra, peak structural response from the response spectrum, response spectrum characteristics,
Generalised Single Degree of Freedom Systems: Generalised single degree of freedom system, rigid body assemblage, system with distributed mass and elasticity, lumped mass system-shear building, and natural vibration frequency by Rayleigh's method.

UNIT – 5   Multi -Degree of Freedom Systems (MDOF)
Equation of motions: simple system-two storey shear building, general approach for linear systems, static condensation, and symmetric plan systems
Free Vibration: Natural frequencies and modes: modal and spectral matrices, Orthogonality of modes, normalization of modes. Solution of undamped free vibration systems, solution methods for Eigenvalue problem.

TEXT BOOKS:
1. Dynamics of structures by Anil K Chopra; Prentice-Hall of India Limited, New Delhi.
2. Dynamics of Structures by R.W. Clough and P.E. Penzien, McGraw-Hill.

REFERENCE BOOKS:
1. Structural Dynamics for Structural Engineers by G. C. Hart & K. Wang; John Wiley & Sons.
2. Structural Dynamics by Mario Paz, CBS Publishers.