Gautam Buddha University, Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
Integrated B. Tech. + M. Tech. / M.B.A.	Mechanical Vibrations	ME 302	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
VI	4	3-1-0	3 Hours

Unit - I

Introduction: Introduction to mechanical vibrations; Important terminology; Degrees of freedom; Harmonic motion; Derivation of equation of motions for 1-D longitudinal; Transverse and torsional vibrations without damping using Newton's second law; D' Alembert's principle and principle of conservation of energy; Compound pendulum and centre of percussion. **(07 hours)**

Unit - II

Single Degree Vibration Systems: Damped vibrations of single degree of freedom systems; Viscous damping; Under-damped; Critically damped and over damped systems; Logarithmic decrement; Vibration characteristics of Coulomb damped and hysteretic damped systems; Rotating unbalance; Modelling of stiffness and damping. **(08 hours)**

Unit - III

Forced Vibrations: Forced vibrations of single degree of freedom systems; Forced vibration with constant harmonic excitation; Frequency response curves and phase angle plot; Forced vibration due to excitations; Vibration isolation and transmissibility; Force transmissibility; Motion transmissibility; Forced vibration with rotating and reciprocating unbalance; Materials used in vibration isolation.

(08 hours)

Unit - IV

Two Degrees of Freedom: System with two degrees of freedom; Principle mode of vibration; Mode shapes; Undamped forced vibrations of two degrees of freedom system with harmonic excitation; Vibration absorber; Undamped dynamic vibration absorber. **(07 Hours)**

Unit - V

Multiple Degrees of Freedom: Multiple degrees of freedom systems and their analyses; Exact and approximate analyses methods; Rayleigh's; Dunkerley's; Stodola's and Holzer's methods; Vibrations of continuous systems; Transverse vibration of a string; Longitudinal vibration of a bar; Torsional vibration of a shaft.

(08 hours)

Unit - VI

Vibration Measurements: Working principles of various vibration measuring instruments; Description of vibration standards; Vibration monitoring techniques; Case studies related to industrial problems. **(07 hours)**

Recommended Books:

1. Theory of Vibration with Applications; W. T. Thomson and M. D. Dahleh; Prentice Hall.
2. Mechanical Vibrations; S. S. Rao; Prentice Hall.
3. Engineering Vibrations; D. J. Inman; Prentice Hall.
4. Introductory Course on Theory and Practice of Mechanical Vibrations; J. S. Rao & K. Gupta; New Age International