Devi Ahilya University, Indore, India Institute of Engineering & Technology			IV Year B.E. (Mechanical Engg.) (Part Time)			
Subject Code & Name	**Instructions Hours per Week**		**Credits**			
MEP8C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
VIBRATION & NOISE CONTROL	2	1	1	2	1	1	4

Learning Objectives:
1. Objective of the subject is to deal with study of basics of the vibrations in a body
2. The main objective of the subject is to deal with study and analysis of vibration phenomenon, control of vibration in machine parts, balancing.
3. The subject also deals with Introduction of basic terminology of noise engineering and noise control.
4. The subject also deals with the Whirling of light flexible shaft.

Pre requisite(s): Dynamics of machine, Machine Design.

COURSE CONTENTS

UNIT-I
Introduction: Periodical motion, harmonic motion, period, cycle, circular frequency, amplitude and phase angles of vibration motion, non-harmonic periodic motions. classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration Harmonic analysis, the vector method of representing vibrations, displacement, velocity and acceleration in harmonic motion, super position of simple harmonic, beats, work done in harmonic motion .

UNIT-II
System with One Degree of Freedom: System having single degree of freedom, free vibration of systems without damping, equilibrium and energy method for determining natural frequency. Raleigh's method, equivalent systems (systems with compound spring, shafts of different dia. Equivalent length, effect of mass of springs and shaft). Free vibration of systems with viscous, coulomb and structural damping. Equations of motions-discussion of solutions. Forced vibrations of systems with and without viscous and coulomb damping,, frequency response plots, Phase shift plots, Equivalent viscous damping, power consumption of vibration systems, forced isolation, commercial isolators, transmissibility.

UNIT-III
Systems with Two Degree of Freedom: System having two degree of freedom system, Normal mode of vibrations, Torsional systems, undamped & damped vibration in two degree of freedom system with free and forced vibration. Vehicle suspension, Undamped dynamic vibration absorber. Centrifugal absorber, friction damper. Vibration Instruments: Principle of frequency, Amplitude, Velocity and acceleration measuring instruments, Analysis of vibration records. Electrical Analogies: Electric circuit principles, equivalent circuits.

UNIT-IV
Whirling of Shafts: Whirling of light flexible shaft with an unbalance disk at the Centre of its length with and without damping, discussion of speeds above and below the critical speed, Uniform shaft with and without unbalanced masses attached along its length (by Rayleigh method) for simple supported and fixed ends.

UNIT-V
Noise Control: Noise and its causes, sound pressure /intensity/ power level and their interrelation, Decibel scale, Loudness and equal loudness contours, Sound spectra and octave band analysis. Background noise. Weighted networks. Measurement of noise, effect of machine/ process noise on operators, employees and local resident's, standard of noise level and exposure limits. Methods of industrial noise control.

Learning Outcomes:
Upon completing the course student will be able to:
1. Understand the basic phenomenon of Vibration and Noise.
2. Find the natural frequency of different mechanical systems.
3. Find out the performance of viscous dampers in force vibration system.
4. Correlate the Mechanical and Electrical System.
5. Control the noise from the Mechanical System.

BOOKS RECOMMENDED:
[1] Ambekar A.G. *"Mechanical Vibrations and Noise Engineering"* Prentice-Hall of India, New-Delhi, 2e, 2006.
[2] Singh V.P.*, "Mechanical Vibration"* Dhanpat Rai& Co.(p)Ltd., Delhi, 3e, 2001
[3] Thomson W.*T "Theory of Vibration with Application"* CBS Publishers & Distriburors, Delhi, 3e, 1990.
[4] Grover G.K.*"Mechanical Vibrations"* Nem Chand & Brothers, 2e, 2007.
[5] Pujara K. *" Vibration & Noise for Engineers*", Dhanpat Rai & Sons, Delhi, 2e,1992.

LIST OF PRACTICAL ASSIGNMENTS

1. To find the natural frequency of a simple pendulum.
2. To determine the radius of gyration of a compound pendulum using vibration phenomenon.
3. To determine the radius of gyration of a body using bifilar suspension method.
4. To determine the radius of gyration of a body using trifilar suspension method.
5. To determine the natural frequency of a spring mass pulley system.
6. To determine natural frequency of a spring mass system.
7. To determine the natural frequency of an undamped forced vibration system. .
8. To determine the natural frequency of a two degree of freedom system.
9. Performance analysis of damped forced vibration system.
10. Performance analysis of undamped dynamic vibration absorber.
11. Study of Vibration measuring instruments.
12. To find out critical speed of shaft using whirling of shaft apparatus.
13. Study of sound level meter.