

Ch. Ranbir Singh State Institute of Engineering & Technology, Jhajjar
DEPARTMENT OF MECHANICAL ENGINEERING
 IV Yr. VII Semester (Mechanical Engineering)

LESSON PLAN

Program : **B. Tech**
 Year & Sem. : **IV / VII**
 Course No : **ME-409-F**
 Course Title : **Mechanical Vibration**
 Max Marks : **100**
 No. of Total Lecture : **45**
 Schedule : **3L+1T=4**
 Lecturer : **Satyapal Yadav**

Recommended Books:

1. Theory of Vibrations with Applications W.T. Thomson, Prentice Hall of India.
2. Mechanical Vibration : G.K. Grover and S.P. Nigam, Nem Chand and Sons

Lesson Plan:

Lect. No(s)	Ref. No.	Topics to be covered
1		Unit I:
2	1.1	Importance of Study of Vibrations, Classifications of Vibrations,
3	1.2	Free and Forced, Undamped and Damped, Linear and Non-linear,
4-5	1.3	Deterministic and Random, Harmonic Motion, Vector and Complex Number Representations,
6	1.4	Definitions and Terminology, Periodic Functions,
7-8	1.5	Harmonic Analysis, Fourier Series Expansion.
9	1.6	Free and Damped Vibrations : Single Degree of Freedom system,
10	1.7	D'Alemberts Principal, Energy Methods, Rayleighs Method,
11	1.8	Application of these Methods, Damped Free Vibrations, Logarithmic Decrement
12	1.9	Under Damping, Critical and Over Damping, Coulomb Damping.
		Unit II:
13	2.1	Harmonically Excited Vibrations : Forced Damped Harmonic Vibration of Single Degree of Freedom Systems,
14	2.2	Rotating Unbalance, Rotor Unbalance,
15	2.3	Critical Speeds and Whirling of Rotating Shafts,
16	2.4	Support Motion, Vibration Isolation,
17	2.5	Energy Dissipated by Damping, Equivalent, Viscous Damping,
18	2.6	Structural Damping Sharpness of Resonance,

19	2.7	Vibration Measuring Instruments.
20	2.8	Transient Vibrations : Impulse Excitation, Arbitrary Excitation,
21	2.9	Response to Step Excitations,
22	2.10	Base Excitation Solution by Laplace Transforms,
23	2.11	Response Spectrum, Runge-Kutta Method.
		Unit III:
24	3.1	Introduction to Multi-Degree of Freedom Systems,
25	3.2	Normal Mode Vibrations, Coordinate Coupling,
26	3.3	Principal Coordinates,
27-28	3.4	Free Vibrations in Terms of Initial Conditions, Forced Harmonic Vibrations,
29	3.5	Vibration Absorber, Centrifugal Vibration Absorber,
30-31	3.6	Vibration Damper, Multi degrees of Freedom Systems and Numerical Methods Introduction,
32	3.7	Influence Coefficients, Stiffness Matrix,
33	3.8	Flexibility Matrix, Natural Frequencies and Normal Modes,
34	3.9	Orthogonality of Normal Modes,
35	3.10	Dunkerley's Equation, Method of Matrix Iteration,
36-37	3.11	The Holzer Type Problem, Geared and Branched Systems, Beams.
		Unit IV:
38-39	4.1	Vibrating String,
40-41	4.2	Longitudinal Vibrations of Rod,
42-43	4.3	Torsional Vibrations of Rod,
44-45	4.4	Lateral Vibrations of Beam.
46		

(Satyapal Yadav)
 Department of ME
 CRSSIET, JHAJIR