Mechanical Vibrations - Video course

SN	Modules	Lectures	Lecture Contents	Remarks
1	I. Introduction	i	Overview of the course, practical applications and research trends	RT-01
2		ii	Harmonic and periodic motions, vibration terminology	RT-02
3	II. Single-DOF Free Vibrations	i	Vibration model, Equation of motion- Natural Frequency	RT-03
4		ii	Energy method, Rayleigh method	RT-04
5		iii	Principle of virtual work, Damping models.	RT-05
6	III. Single-DOF Free Vibrations	i	Viscously damped free vibration	RT-06
7		ii	Special cases: oscillatory, non-oscillatory and critically damped motions.	RT-07
8		iii	Logarithmic decrement, Experimental determination of damping coefficient.	RT-08
9	III. Single-DOF Free Vibrations	i	Forced harmonic vibration, Magnification factor.	RT-09
10		ii	Rotor unbalance, Transmissibility	RT-10
11		iii	Vibration Isolation	RT-11
12		iv	Equivalent viscous damping, Sharpness of resonance.	RT-12
13	IV. Two-DOF Free Vibrations	i	Generalized and Principal coordinates, derivation of equations of motion	SKD-01
14		ii	Lagrange's equation	SKD-02
15		iii	Coordinate coupling	SKD-03

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16		iv	Forced Harmonic vibration	SKD-04
17	V. Vibration Absorber	i	Tuned absorber, determination of mass ratio.	SKD-05
18		ii	Tuned and damped absorber, unturned viscous damper.	SKD-06
19	VI. Multi-DOF	i	Derivation of equations of motion, influence coefficient method	SKD-07
20		ii	Properties of vibrating systems: flexibility and stiffness matrices, reciprocity theorem	SKD-08
21		iii	Modal analysis: undamped	SKD-09
22		iv	Modal analysis: damped	SKD-10

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23	VII. Calculation of natural frequencies	i	Rayleigh method	SKD-11
24		ii	Stodala method	SKD-12
25		iii	Matrix iteration method	SKD-13
26		iv	Holzer method and Dunkerley's method	SKD-14
27	VIII. Torsional vibration	i	Simple systems with one or two rotor masses	RT-13
28		ii	Multi-DOF systems-transfer matrix method	RT-14
29		iii	Geared system	RT-15
30		iv	Branched system	RT-16
31	IX. Continuous systems : closed form solutions	i	Vibration of strings	SKD-15
32		ii	Longitudinal and torsional vibration of rods	SKD-16
33		iii	Transverse vibration of beams: equations of motion and boundary conditions	SKD-17
34		iv	Transverse vibration of beams: natural frequencies and mode shapes	SKD-18
35	X. Continuous	i	Rayleigh's energy method	SKD-19

36	Continuous systems : Approximate solutions	ii	Rayleigh-Ritz method	SKD-20
37		iii	Assumed modes and Galerkin's method	SKD-21
38	XI. Finite element analysis	i	Finite element formulation for beams: Galerkin's method	RT-17
39		ii	Beams elemental mass and stiffness matrices, Elemental force vector,	RT-18
40		iii	Global finite element assembly and imposition of boundary conditions and solution procedure.	RT-19
41		iv	Finite element formulation for rods.	RT-20
42	XI. Signature analysis and preventive maintenance	i	Vibration testing equipments: signal generation, measuring and conditioning instruments	RT-21
43		ii	Vibration testing equipments: signal analysis instruments	RT-22
44		iii	Vibration signatures and standards	RT-23
45		iv	Field balancing of rotors	RT-24