

Course Code	Course Name	Credits
MEDLO7042	Vibration Controls	03

Objectives :

1. To study Vibration Absorbers.
2. To study Vibration Isolators.
3. To study Vibration Control.

Outcomes: Learner will be able to...

1. Apply basic concepts of Vibration Isolation and Damping.
2. Identify suitable Vibration Absorber
3. Identify suitable Vibration Isolator
4. Apply suitable method to Control the vibrations to the acceptable level.

Module	Contents	Hours
1	1.1 Introduction: Vibration reduction at source, factors affecting vibration level, isolation of the source, methods of vibration control, dynamic properties and selection of materials	05
2	2.1 Dynamic vibration absorbers: Dynamic vibration neutralizers, self-tuned pendulum neutralizer, optimum design of damped absorbers, absorber with ideal spring and viscous dashpot, gyroscopic vibration absorbers, impact absorbers, absorbers attached to continuous systems	08
3	3.1 Vibration isolation of single degree of freedom systems: Isolators with complex stiffness, Isolators with Coulomb damping, Three-element isolators, Two-stage isolators, Pneumatic suspension, Concept of negative stiffness in vibration isolation	08
4.	4.1 Active vibration control: Classification and modelling, actuators and sensors for active vibration control, Active vibration absorption and damping, classical control, optimal control, Piezoelectric transducers for active vibration control 4.2 Semi-active vibration control: Introduction, Magneto-rheological fluids, MR models and devices, semi-active suspension, narrowband disturbance	08

5	5.1 Active, semi-active, and adaptive dynamic vibration absorbers: Active tuned vibration absorber, active mass damper, adaptive vibration absorber, semi-active tuned vibration absorber	05
6	6.1 Active and semi-active vibration isolation: Active single-axis base isolation, active force isolation system, isolator based on piezoelectric stack actuator, semi-active isolation, Adaptive-passive vibration isolation, active control of vehicle suspensions	05

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

5. Question paper will comprise of total **six questions, each carrying 20 marks.**
6. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum.**
7. **Remaining questions will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
8. Only **Four questions need to be solved.**

Text/Reference Books:

1. A.K. Mallik and A. Chatterjee, “Principles of Active and Passive Vibration Control”, East-West-Press 2014, ISBN: 9788176710985
2. A. Preumont, “Vibration Control of Active Structures”, Springer 2018, ISBN: 9783319722962
3. S.S. Rao, “Mechanical Vibrations”, 5th Edition 2004, Pearson Publications
4. Clarence de Silva, “Vibration: Fundamentals and Practice”, 1st Edition 2000, CRC Press, ISBN: 0849318084

Links for online NPTEL/SWAYAM courses:

<https://nptel.ac.in/courses/112104211>– Principles of Vibration Control, IIT Kanpur

<https://nptel.ac.in/courses/112107088>– Vibration control, IIT Roorkee