ATF 224 - Noise and Vibration

(02 credits – 50 marks)

Learning Objectives:

The course should enable students:
1. Understand the characteristics and Sources of noise and vibrations in a vehicle.
2. Understand the environmental noise management system.

Learning Outcomes:

After completion of the course, students are expected to be able to:
1. Explain vehicle noise and vibration level measurement techniques.
2. Identify causes and remedies for vibrations.
3. Carry out troubleshooting and maintenance to control noise and vibration in a vehicle.

Course Content:

Module –I: Noise: **(04 Hours)**

Noise characteristics, Sources of noise, noise level measurement techniques, vehicular noise level, engine noise, transmission noise, brake squeal, structural noise, noise in auxiliaries, wind noises etc.

Module –II: Noise Testing & Noise Control: **(04 Hours)**

Mechanization of noise generation, noise control methodologies, noise control measures, environmental noise management. Road vehicle noise standards

Module –III: Vibration: **(09 Hours)**

Introduction, Single degree of freedom, damped, forced vibration, Multi degree of freedom vibration, modes, nodes, Holzer's method. Multi degree of freedom of vibration, matrix method, eigen values and vectors, natural frequencies & modes, model analysis, numerical methods for solution, Lagrange's equation for problem formulation, Two degree of freedom system, co-ordinate, coupling, solution Vibration under periodic force, use of Fourier series, Vibration of continuous systems, transverse vibration of cable, bar, torsion vibration of shaft, Rayliegh's method, Reyliegh-Ritz method

Module –IV: Vibration control **(07 Hours)**

Balancing of reciprocating & rotating masses, controlling natural frequencies, vibration isolation, vibration absorbers, Basics of non-linear vibration, causes of non-linearity, formulation, solution methods, iterative, graphical, methods of isoclines, stability of equilibrium state, types of singularity, limits cycle. Basic vibration measuring set up, brief introduction to experimental model analysis

Module –V: Assignments / seminars / case studies on Module -I to Module – IV (6 Hrs)

References:

1. Mechanical Vibration – S. S. Rao, New Age International (P) Ltd., New Delhi, ISBN: 9780201065510
2. Engineering Mechanics Static & Dynamics – I. H. Shames, ISBN-10 8177581236
3. Mechanical Vibration Analysis, P. Srinivasan, Tata McGraw Hill Pub. New Delhi, ISBN: 9780074519332
4. Non-linear Mechanical Vibration – P. Srinivasan, Tata McGraw Hill Pub. New Delhi, ISBN: 978-0-470-23439-6
5. Fundamental of Mechanical Vibration – S. Graham Kelly, Tata McGraw Hill Pub., ISBN-10: 1577666917
6. Mechanical Vibration – Grover G. K., Nem Chand & Brothers, Roorkee, ISBN-13:9788185240565
7. Engineering Vibration – Daniel J. Inman, Prentice Hall, NJ, 4th Edition, ISBN: 9780132871693
8. Theory of Vibrations – W. T. Thomson, CBS Publishers, New Delhi, ISBN 13: 9780136510680
   Noise, Pollution & Control – S. P. Singal, Narosa Publishing House, New Delhi, ISBN: 9788173193637