

Course code	Course Name	L-T-P - C	Year of Introduction
AU486	Noise, Vibration and Harshness	3-0-0-3	2016
<b>Prerequisite : NIL</b>			
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>To impart the basics of noise, vibration, sources of vibration and noise in automobiles</li> <li>To study the effect of noise and vibration on human beings and nature.</li> <li>To introduce the methods of measurement of noise and vibration.</li> <li>To provide knowhow on various methods to reduce the vibration and noise</li> </ul>			
<b>Syllabus</b> Fundamentals of Acoustics and Noise, Vibration - Effects of Noise, Blast, Vibration, and Shock on People- Introduction to Transportation Noise and Vibration Sources – Engine noise - Reduction of noise and vibrations - Noise and Vibration Transducers - Noise and Vibration Measurements - Vibration Data Analysis			
<b>Expected outcome.</b> The students will <ol style="list-style-type: none"> <li>understand the sources, effects, prediction, control techniques, measurement techniques of noise, vibration pertain to an automobile</li> <li>know about reduction of noise and vibration from an automobile.</li> </ol>			
<b>Text Books:</b> <ol style="list-style-type: none"> <li>Clarence W. de Silva , “Vibration Monitoring, Testing, and Instrumentation “,CRC Press, 2007</li> <li>Colin H Hansen “Understanding Active Noise Cancellation“ , Spon Press , London 2003</li> <li>Kewal Pujara “Vibrations and Noise for Engineers, Dhanpat Rai &amp; Sons, 1992.</li> <li>Singiresu S.Rao, “Mechanical Vibrations” - Pearson Education, ISBM –81-297-0179-2004.</li> </ol>			
<b>References:</b> <ol style="list-style-type: none"> <li>Allan G. Piersol ,Thomas L. Paez “Harris’ Shock and Vibration Handbook” , McGraw-Hill , New Delhi, 2010</li> <li>Bernard Challen and Rodica Baranescu - “Diesel Engine Refrence Book” - Second edition - SAE International - ISBN 0-7680-0403-9 – 1999.</li> <li>David A.Bies and Colin H.Hansen “Engineering Noise Control: Theory and Practice “Spon Press, London, 2009</li> <li>Julian Happian-Smith - “An Introduction to Modern Vehicle Design”- Butterworth-Heinemann, ISBN 0750-5044-3 – 2004</li> <li>Matthew Harrison “Vehicle Refinement: Controlling Noise and Vibration in Road Vehicles “, Elsevier Butterworth-Heinemann, Burlington, 2004</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	End Sem. Exam Marks
I	Fundamentals of Acoustics and Noise, Vibration: Introduction, classification of vibration and noises: Theory of Sound—Predictions and Measurement, Sound Sources, Sound Propagation in the Atmosphere, Sound Radiation from Structures and Their Response to	7	15%

	Sound, General Introduction to Vibration, free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems		
<b>II</b>	Effects of Noise, Blast, Vibration, and Shock on People: General Introduction to Noise and Vibration Effects on People and Hearing Conservation, Noise Exposure, Noise-Induced Annoyance, Effects of Infrasound, Low-Frequency Noise, and Ultrasound on People, Effects of Intense Noise on People and Hearing Loss, Effects of Vibration on People, Effects of Mechanical Shock on People, Rating Measures, Descriptors, Criteria, and Procedures for Determining Human Response to Noise.	7	15%
<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	Introduction to Transportation Noise and Vibration Sources, Noise Characteristics of engines, engine overall noise levels, assessment of combustion noise, assessment of mechanical noise, engine radiated noise, intake and exhaust noise, engine accessory contributed noise, transmission noise, aerodynamic noise, tyre noise, brake noise	7	15%
<b>IV</b>	Reduction of noise and vibrations I: Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.	7	15%
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	Reduction of noise and vibrations: noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis. Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers	8	20%
<b>VI</b>	Noise and Vibration Transducers, Analysis Equipment, Signal Processing, and Measuring Techniques: General Introduction to Noise and Vibration Transducers, Measuring Equipment, Measurements, Signal Acquisition and Processing, Acoustical Transducer Principles and Types of Microphones, Vibration Transducer Principles and Types of Vibration Transducers, Sound Level Meters, Noise Dosimeters, Analyzers and Signal Generators, Equipment for Data Acquisition, Noise and Vibration Measurements, Determination of Sound Power Level and Emission Sound Pressure Level, Sound Intensity Measurements, Noise and Vibration Data Analysis, Calibration of Measurement Microphones, Calibration of Shock and Vibration Transducers.	8	20%
<b>END SEMESTER EXAM</b>			

## Question Paper Pattern

Maximum marks: 100

Duration: 3 hrs

The question paper should consist of three parts

### Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks  
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

### Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks  
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

### Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks  
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

**Note:** In all parts, each question can have a **maximum** of four sub questions, if needed.



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