

**SPEAKERS**



**Keynote Speaker: Mr. S. Raju:**  
Ex Senior Dy. Director,  
ARAI, Pune.



**Speaker II: Dr. M. N. Ambardekar:**  
Assistant General Manager,  
Engineering Research Centre,  
Tata Motors, Pune.



**Speaker III: Dr. Gyan Arora:**  
Ex. Tata Motors, Pune.  
Consultant, Pune.



**Speaker IV: Mr. Bhavesh Kumar:**  
Technical Manager,  
SIMULIA India, Chennai.



**Speaker V: Mr. Chris Carlson:**  
Principal Engineer,  
Vehicle Integration Department,  
Tata Motors European Technical Centre,  
Warwick University, UK.



**Speaker VI: Dr. Filip Deblauwe:**  
Business Development Manager,  
LMS International, Belgium.



**Speaker VII: Mr. N. V. Karanth:**  
Dy. Director & Head, NVH Lab,  
ARAI. Pune.



**Speaker VIII: Mr. M. S. Kumbhar:**  
General Manager, Product Development and  
Head NVH & CFD groups,  
Mahindra & Mahindra, Nasik.



**Speaker IX: Dr. M. L. Munjal:**  
Professor,  
Indian Institute of Science, Bangalore.



**Speaker X: Dr. B. V. A. RAO:**  
Emeritus Professor & Advisor to Chancellor,  
VIT University, Vellore.



**Speaker XI: Dr. Pranab Saha:**  
Principal Consultant, Acoustics,  
Noise & Vibration and Co-founder of  
Kolano and Saha Engineers, Inc., USA



**Speaker XII: Mr. S. S. Sandhu:**  
Dy. Director & Head, Vehicle Evaluation Laboratory,  
ARAI, Pune.



**5 Day Proficiency Improvement Programme on  
Automotive Noise, Vibration & Harshness (NVH)**

at  
**ARAI, Pune**

(The Automotive Research Association of India)

**from 10<sup>th</sup> to 14<sup>th</sup> May 2010**

We confirm the following will attend the above Course :

| Name | Qualification | Designation |
|------|---------------|-------------|
|      |               |             |
|      |               |             |
|      |               |             |

Signature:

Name & Designation:

Company:

Address:

Email ID:

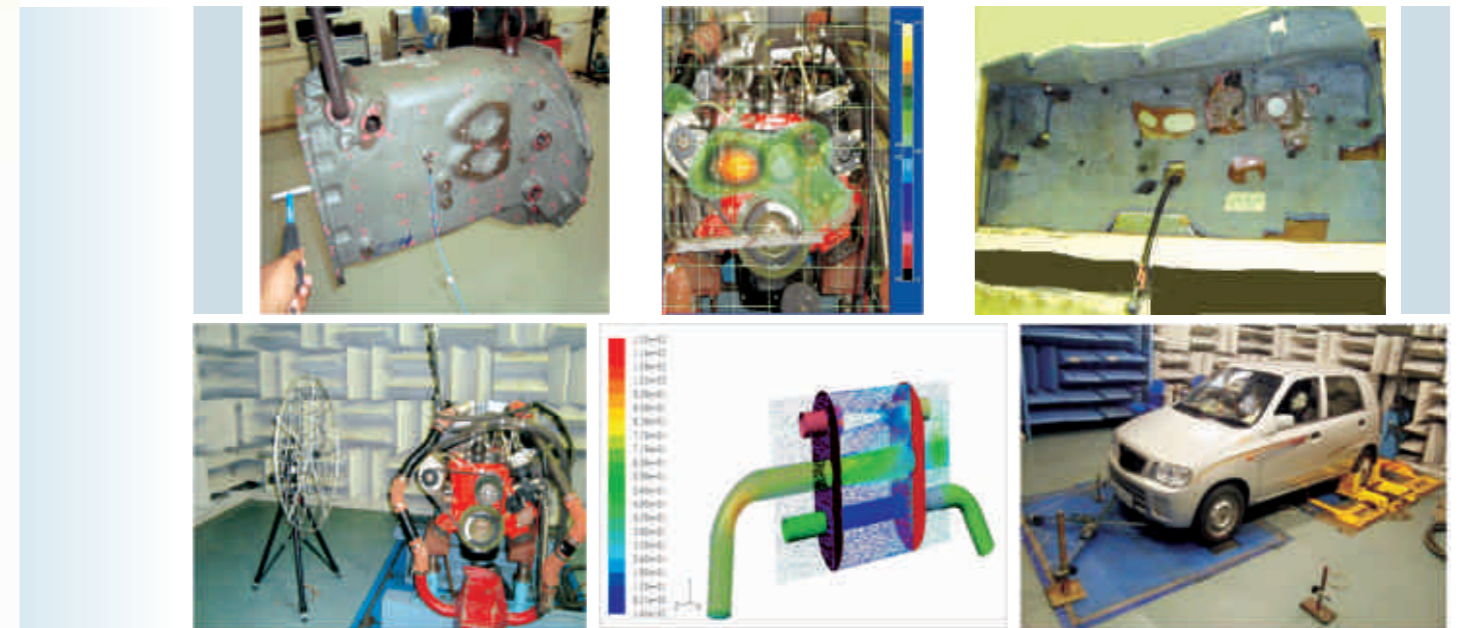
Please fax / email / post duly filled-in registration form on or before **3rd May 2010** to:

**Dr. K. C. Vora**  
ARAI Academy  
ARAI Post Box 832, Pune 411004  
S.No.1 02, Vetal Hill, Off Paud Road, Kothrud, Pune.  
Tel: **020-3023 1241 / 1245/1111** ■ Fax: 020-25434190  
Email: **palse.pga@araiindia.com**  
**patil.pga@araiindia.com**

**Excellence in Education...  
The Drive continues...**



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Organised by





**BACKGROUND & OBJECTIVES**

Today's need of automotive industry is to develop a vehicle with low noise and high comfort. Using engineering principles, it is possible to design such vehicles in cost effective manner. For an engineer to analyze the noise for quieter product design, the conceptual knowledge of sound and vibration fields and their interaction with each other is essential. NVH is among the most important area that needs to be addressed by the designer in order to satisfy the customer as well as to meet the norms. The aim of this module is to elucidate the basic and advanced technology in the field of Automotive NVH.

**INTENDED LEARNING OUTCOME:**

On completion of the module, the delegates should be able to:

- Describe the basics of Automotive NVH.
- Broaden the understanding of sound measurement and human sensitivity.
- Identify sources of noise and vibration.
- Understand Vibration Analysis.
- Understand Modal Analysis.
- Understand Noise Control aspects during design of Intake & Exhaust System.
- Understand Transfer Path Analysis.
- Understand Passby Noise Legislation & Control.
- Understand Vibration Isolation - Mounting System.
- Understand Psychoacoustics & Sound Quality.
- Understand Powertrain & Drive Line NVH.
- Understand Acoustic Pack Development.
- Understand latest trends in NVH Analysis & Control.
- Demonstrate independent learning ability necessary for conducting professional development.
- Become self-disciplined and self-motivated, demonstrating personal responsibility in the pursuit of studies and professional practice.

**PROGRAMME****Day One**

- 08.30 - Registration
- 09.30 - Inauguration & Welcome Address
- 10.00 - Keynote Address
- 11.00 - Tea Break
- 11.15 - Course Introduction
- 12.00 - Introduction to Automotive NVH & Customer Requirements
- 14.00 - LUNCH
- 15.00 - Structure Borne Sound – Analysis and Control
- 16.00 - Tea Break
- 16.15 - Modal Analysis
- 18.00 - Conclusion

**Day Two**

- 09.00 - Design for Intake & Exhaust Noise Control
- 11.00 - Tea Break
- 11.15 - Psychoacoustics & Sound Quality
- 12.15 - Transfer Path Analysis
- 14.00 - LUNCH
- 15.00 - Passby Noise Legislation & Control
- 16.45 - Tea Break
- 17.00 - Vibration Isolation - Mounting System
- 18.00 - Conclusion

**Day Three**

- 09.00 - Practical Demo in Batches on following:
  - Modal Analysis using Scanning Laser Vibrometer
  - Acoustic Material Characterization
- 14.00 - LUNCH
- 15.00 - Practical Demo in Batches on following:
  - Noise Source Identification using Acoustic Holography
  - Passby Noise Test Demo
- 18.00 - Conclusion

**Day Four**

- 10.00 - Drive Line NVH
- 11.00 - Tea Break
- 12.15 - Accelerated NVH Development with Special Emphasis on Body NVH
- 14.00 - LUNCH
- 15.00 - Acoustic Pack Development
- 17.00 - Tea Break
- 17.15 - Quiz & Discussions
- 18.00 - Conclusion

**Day Five**

- 09.00 - NVH CAE Capability (Vehicle/Body/Powertrain)
- 11.00 - Tea Break
- 11.15 - FEA Analysis of a full Vehicle Model for Noise & Vibration Characteristics
- 14.00 - LUNCH
- 15.00 - Automotive Brake Squeal using Complex Modes Approach
- 16.00 - Written Test
- 16.45 - Tea Break
- 17:00 - Valedictory function
- 18.00 - Conclusion

**WHO SHOULD ATTEND?**

- Organisations involved in R&D, design, testing, instrumentation and marketing
- NVH / CAE / Design / Validation Engineers
- Vehicle / Engine / Off Highway / Aircraft / Ship / Locomotive manufactures
- Engineering / Consulting companies
- Professors / Engineering students
- Engineers interested in pursuing further studies on part time or full time basis

**REGISTRATION FEES**

| Category                     | Registration Fees (Rs.) | Total Fees including Tax of 10.3% (Rs.) |
|------------------------------|-------------------------|---|
| Engineers & Professionals    | 25000.00                | 27575.00                                |
| Teaching Faculty             | 15000.00                | 16545.00                                |
| Engineering College Students | 10000.00                | 11030.00                                |

**Registration Fees include**

- Breakfast
- Lunch
- Delegate Kit

**MODE OF PAYMENT**

At Par / Multicity cheque or demand draft in favour of

**The Automotive Research Association of India**

payable at Pune.

ARAI, over four decades, has provided its design and development expertise to the Indian automotive industry, focusing on the testing and evaluation of components and systems to meet national and international standards. ARAI strives to achieve international recognition in these areas. In keeping with the globalization of economy and business, ARAI continues to enlarge its scope of services to meet the requirements of automotive industries around the world.

In addition to utilizing state-of-the-art technology, laboratories and highly-trained personnel, ARAI recognizes the need to develop a new generation of engineers to meet the demands of the automotive industry, not just in India but across the globe.



Participants in Certificate Course

ARAI Academy is classified into three divisions, viz Learning Centre, Knowledge Centre and Training Centre.

Learning Centre has embarked upon a programme of building up human resources by commencing educational programme (Graduate & Post Graduate) with specialization in Automotive Engineering. It has tied up with VIT University (Vellore), Veltech University (Chennai), University of Alabama (USA), Loughborough University (UK) and Braunschweig University (Germany).

Knowledge Centre has collection of around 11,000 books & standards, 50,000 technical papers and numerous journals, technical reports and seminar / conference proceedings. It publishes monthly magazine "Automotive Abstracts" and supplies CDs of CMVR Type Approval Handbook and Automotive Industry Standards (AIS).

Training Centre has devised various Proficiency Improvement Programmes (PIPs). It gives engineers, faculty and student's knowledge and technical expertise in a wide range of automotive disciplines. It helps in understanding systems view point for automotive design and manufacture, with specific skills in formulating automotive engineering solution in terms of their function and performance, through optional modules.

Please visit [www.araiindia.com](http://www.araiindia.com) for more information.