

# ***GEAR DYNAMICS AND GEAR NOISE SHORT COURSE***

to be held at  
Fawcett Center  
The Ohio State University Campus  
Columbus, Ohio 43210, USA

Taught by  
Dr. Rajendra Singh, Dr. Ahmet Kahraman and Dr. David Talbot  
NVH & Gear Education  
<http://www.nvhgear.org/>

June 2 - 5, 2025  
(Monday - Thursday)

## **GEAR DYNAMICS AND GEAR NOISE COURSE**

- *Gear Whine and Rattle*
- *Transmission Error - The Main Source*
- *Measurements for Gear Noise Diagnosis*
- *NVH Issues*
- *Gear Dynamics*
- *Profile Design, and Manufacturing Issues*
- *Application to e-drives or e-vehicles*
- *Transmission Paths and Casing Acoustics*
- *Design Guidelines for Noise and Vibration Reduction*
- *Laboratory Tour*
- *Demo of GearLab Computer Software*
- *Interactive Workshop*

## **PURPOSE**

The purpose of this unique short course is to provide a better understanding of the mechanisms of gear noise generation, methods by which gear noise is measured and predicted, and techniques employed in gear noise and vibration reduction. Over the past 40+ years about 2,600 engineers and technicians from over 395 companies have attended the Gear Noise Short Course. This annual course is taught in-person mode with no virtual component.

## **WHO SHOULD ATTEND**

The course is of particular interest to engineers and technicians involved in the analysis, manufacture, design specification, or utilization of simple and complex gear systems. Industries that find this course helpful include the automotive (including the e-vehicles), transportation, wind-energy, process machinery, aircraft, appliance, general manufacturing, and all gear manufacturers.

The course material is covered in such a way that the fundamentals of gearing, gear dynamics, noise analysis and measurements are covered first. This makes the course appropriate to the gear designer with minimal knowledge of noise and vibration analysis as well as to the noise specialist with little knowledge of gears.

## **COURSE LECTURES (FIRST 3 DAYS)**

A popular feature of this course is the interspersing of demonstrations with lectures. The extensive measurement and computer software capabilities of the Gear and Power Transmission Research Laboratory (GearLab) allow us to do this in a simple and non-commercial manner.

On the first day, the lecturers discuss why even perfect gears make noise. They present in both qualitative and quantitative terms how gear design parameters and manufacturing errors affect noise. The concept of gear transmission error, one of the major contributors to gear noise,

is developed, and methods of predicting transmission errors from design and manufacturing data are presented. Participants get a clear physical insight into the problems they face and how they may apply course knowledge to help solve their gear noise problems.

On the second day, lecturers concentrate on casing dynamics and acoustics, dynamics of parallel axis and planetary gears, transmission error calculations, gear excitations and measurements. The third day's lectures briefly discuss the sources and simulation models of gear rattle as well as spending several hours in the case history workshop. Roles of macro- and micro-designs along with effect of the spacing error will be discussed in some detail. Software verification and experimental validation issues will be briefly mentioned.

## LABORATORY TOUR ON DAY 2

Throughout the course, laboratory and computer software demonstrations are used to illustrate gear noise & vibration measurement and analysis techniques. The facilities of the Gear and Power Transmission Research Laboratory ([gearlab.org](http://gearlab.org)) and the Acoustics and Dynamics Laboratory ([mae.osu.edu/adl](http://mae.osu.edu/adl)) are used for these demonstrations.

## CASE HISTORY WORKSHOP ON DAY 3

This novel approach to discussing "real life" gear noise and dynamics problems has been used in this course since its inception. The workshop, which has been lauded by past attendees for its practical flavor, takes place on the third day of the course. The purpose of this workshop is to allow the course instructors and participants to interact and to discuss gear noise and dynamics case histories presented by course attendees. They are asked to present a brief synopsis of problems they have encountered or of a procedure they have used for gear noise analysis and reduction. Possible approaches to solve each problem will be discussed.

## SIMULATION AND EXPERIMENTAL METHODS SESSIONS ON DAY 4

The sessions on Day 4 will address the following topics and related simulation or experimental methods:

- Planetary gear dynamics and modulations
- Geared system and acoustic models
- Advanced gear excitation measurements
- Gear rattle and driveline transients

See web page ([www.nvhgear.org](http://www.nvhgear.org)) for more details including the typical agenda.

## COURSE INSTRUCTORS

- **Dr. Rajendra Singh**  
Academy (Emeritus) Professor and Director of the OSU Acoustics & Dynamics Laboratory
- **Dr. Ahmet Kahraman**  
Professor and Director of the OSU Gear and Power Transmission Research Laboratory
- **Dr. David Talbot**  
Assistant Professor
- **Supporting Staff:** See the [nvhgear.org](http://nvhgear.org) for the names and bios of other experts and staff members

## GENERAL INFORMATION

### Registration:

1. Advance registration is required and should be completed as soon as possible. Payment form (via a major credit card) is posted on the web site. Applicants are usually accepted on a first come, first served basis. There are limited seats and thus the organizers reserve the right to limit admission to the best qualified.
2. Course payment must be completed along with or immediately after the registration to confirm the enrollment.
3. Relevant information on the agenda, nearby hotels, parking, airport transportation, etc. are posted on the web page ([nvhgear.org](http://nvhgear.org)).

### Contact:

- Dr. Rajendra Singh ([singh.3@osu.edu](mailto:singh.3@osu.edu) or [singh@nvhgear.org](mailto:singh@nvhgear.org)) for registration information, technical content and workshop topics

