

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 5 - 8, 2023
(Monday - Thursday)

GEAR DYNAMICS AND GEAR NOISE COURSE

- *Gear Whine and Rattle*
- *Transmission Error - The Main Source*
- *Measurements for Gear Noise Diagnosis*
- *Noise, Vibration and Harshness Issues*
- *Gear Tooth, Shaft & Bearing Dynamics*
- *Profile Design, and Manufacturing Issues*
- *Transmission Paths and Housing Acoustics*
- *All Types of Gears*
- *Noise and Vibration Reduction Techniques*
- *Laboratory Demonstrations*
- *Demo of GearLab Computer Software*
- *Design Guidelines & Optimization*

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 2,500 engineers and technicians from over 380 companies have attended the Gear Noise Short Course.

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 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 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 gear system dynamics and acoustics, dynamics of parallel axis and planetary gears, transmission error calculations and measurements. The role of spacing error will be discussed as well.

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.

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.

LABORATORY DEMONSTRATIONS 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) and the Acoustics and Dynamics Laboratory (mae.osu.edu/adl) are used for these demonstrations.

SIMULATION AND EXPERIMENTAL METHODS SESSIONS ON DAY 4

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

- a. Planetary gear dynamics and modulations
- b. Geared system and acoustic models
- c. Advanced gear excitation measurements
- d. Gear rattle and vehicle clunk case studies
- e. Verification and experimental validation issues

See web page (www.nvhgear.org) for more details.

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 for the names and bios of other experts and staff members

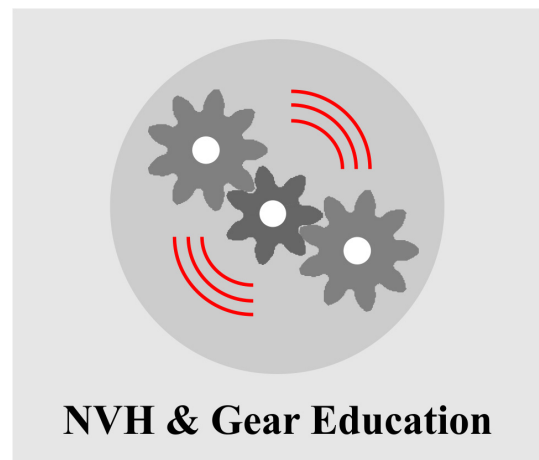
GENERAL INFORMATION

Registration:

1. Advance registration is required and should be completed as soon as possible. Payment details (via major credit card) are posted on the web site. Applicants are usually accepted on a first come, first served basis to the limit of the course. However, 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 attendance.
3. The latest agenda, nearby hotels, parking, airport transportation, and other relevant information are posted on the web page (nvhgear.org).

Contact:

- Dr. Rajendra Singh (614-292-9044, singh.3@osu.edu or singh@nvhgear.org) for registration information, technical content and workshop topics



REGISTRATION

Please register me in the **GEAR DYNAMICS AND GEAR NOISE SHORT COURSE**
June 5 – 8, 2023 (Monday – Thursday)

(please type or print)

Name:

First

(Middle)

Last

Name for badge:

Company:

Position:

Address:

City

State

Zip Code

Country

E-mail:

Work Phone:

Cell Phone:

**How did you
hear about us?**

Please register me for:

\$2,675 per person – early bird rate (valid until March 6, 2023)

\$2,875 per person – regular rate (from March 7, 2023)

Special meals requested or dietary restriction (please specify) _____

Payment of \$ _____ will be paid by:

Check (payable to NVH & Gear Education)

Major Credit Card (See page 4; information needed is also posted on the web site)

***Note that we can NOT accept a purchase order.
Additional charges apply for invoicing, wire transfer, etc.***

Case History Workshop: I would be interested in speaking briefly on the following problem or topic in the workshop on Day 3.

Please send this form (and credit card information) to:

Prof. Raj Singh via email at (singh.3@osu.edu or singh@nvhgear.org)

Mail the check to: NVH & Gear Education, PO Box 3201, Dublin, OH 43016, USA

PAYMENT USING CREDIT CARD FOR GEAR DYNAMIC AND GEAR NOISE SHORT COURSE JUNE 5 – 8, 2023

— Course Fee: \$2,675 per person – early bird rate (valid until March 6, 2023)

— Course Fee: \$2,875 per person – regular rate (from March 7, 2023)

Notes:

1. Additional charges apply for other requests such as invoicing, wire transfer, etc.
2. Purchase orders are not accepted.
3. Please contact Prof. Singh if there are any questions re alternate payment methods.

Information needed for the credit card transaction

Card type (select one): _____ Visa _____ MasterCard or _____ American Express

Account number: _____

Expiration date: _____ Month _____ Year

Card Verification Code: _____

The Card Verification Code (CVC 2, CVV2 or CID): a three-digit number located on the back of Visa or MasterCard cards; four-digit number on the front of American Express cards.

Cardholder (or Company) Name: _____

Cardholder's Phone Used for the Card: _____

Cardholder's Address: _____ (number and street)
_____ (city), _____ (state), _____ (zip), _____ (country)

- Amount to charge: _____ (in US Dollars)
- Name(s) of course registrant(s) covering this charge: _____

Email address for sending the transaction receipt: _____

Person completing the information (if different from above): _____

Date: _____ Signature: _____