Introduction
The need for noise control and its relation to gear drive design will be discussed.

The Noise Problem
The general nature of noise and its measurement will be examined, with particular emphasis on terminology standards, and units of measurement appropriate to gear technology.

The Mechanism of Noise Generation
Gear noise, per se, is seldom heard by and observer. The mechanism by which observer noticed noise is generated and transmitted will be defined, described, discussed.

Defining the Specific Nature of Noise
Before attempting to solve a noise problem with an existing unit or beginning the design of a new unit, the nature of the noise must be defined. Both experimental and analytical methods will be covered, with particular emphasis on application rather than theory.

Design Considerations to Minimize Noise
The many factors that influence the noise produced by a gear system will be discussed. The relative effects of each factor will be studied qualitatively. Factors to be considered include gear tooth geometry and accuracy, speed, materials, housing design, bearing type, gear type, air entrapment, root clearance, interference alignment, surface finish, and phasing.

Noise Reduction in the Hardware Stage
Although, ideally, the designer should solve noise problems on the drawing board, in the real world this sometimes does not occur. Various techniques that can reduce the noise level of existing gear systems without requiring major hardware replacement will be presented and discussed. Included in the discussion will be enclosures, absorbers, dissipative dampers, isolators (gearbox and gear blank), and impulse phasing.

Review and Discussion
Although solutions to particular student-furnished noise problems cannot be promised, you will be encouraged to raise questions for class discussion.

Learning Objectives
- Understand the need for gearbox system noise control and, especially, the difference between “gear noise” and “gearbox system noise”
- Become familiar with the “nature” of noise and its measurement as well as terminology standards, and units of measurement appropriate to gear technology.
- Learn the mechanisms by which observer noticed noise is generated and transmitted
• Gain a knowledge of the experimental and analytical methods for measuring noise, with particular emphasis on application rather than theory.

• Explain the importance of equal planet/star gear spacing and how a system be designed with unequal planet spacing.

• Understand the various design and manufacturing factors that influence gear system noise including gear tooth geometry and accuracy, speed, materials, housing design, bearing type, gear type, air entrapment, root clearance, interference alignment, surface finish, and phasing.

• Recognizing that it is often necessary to address noise issues after the gearbox system is designed, learn how enclosures, absorbers, dissipative dampers, isolators (gearbox and gear blank), and impulse phasing can be applied to existing systems to reduce noise level.

Required Textbooks (Provided by AGMA)
AGMA’s Gear Systems Design for Minimum Noise by Raymond J. Drago

STUDENT FEEDBACK AND GRADING PROCEDURES

Assignments
Assignments and learning activities are given and directed at the discretion of the instructor.

COURSE MANAGEMENT

Weather Delays and Cancelations
We will communicate any cancellations, delays or other concerns for safety prior to class via email, voicemail, and/or text message. Please be sure that we have all pertinent contact information as you travel to your class location.

Attendance for Domestic and International Students
Please be mindful that these are short, accelerated courses. Attendance is extremely important. If you are going to be absent from any class day, please contact the course coordinator. Casandra Blassingame, Vice President of Education Services, blassingame@agma.org or Rosemarie Bundoc, Education Manager, bundoc@agma.org.

Plagiarism, Cheating and other types of Misconduct
Plagiarism¹, cheating and other types of misconduct are unacceptable.

Students with Disabilities
Students requiring assistance and accommodation should complete the Special Accommodation Request form and submit it to Rosemarie Bundoc at bundoc@agma.org. She can be reached at 703-838-0069.

¹ Plagiarism is defined as “the use or close imitation of the language and thoughts of another author and the representation of them as one’s own original work.”
Grievance Procedures
Students who have concerns about the class are encouraged to contact Casandra Blassingame, Vice President of Education Services at blassingame@agma.org or 703-838-0055.

Outline Changes
The instructor reserves the right to modify the outline during the course of the class.

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<th>LEARNING AND OTHER RESOURCES</th>
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Links for writing resources:
- grammar.ccc.commnet.edu/grammar
- www.merriam-webster.com

Links for Math resources:
- www.sosmath.com
- Khan Academy on www.youtube.com

Links for time management, study skills and note taking resources:
- www.mindtools.com
- www.testakingtips.com

Links for career resources:
- https://www.agma.org/newsroom/jobs/

Industry News:
- https://www.agma.org/newsroom/industry-news/