INSTRUCTORS:
William ‘Mark’ McVea
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Who Should Attend
This course will appeal to anyone who is interested in gears, gear systems, design development or measurement and inspection techniques. More specifically, anyone responsible for the following will benefit; Mechanical power transmission system design, development, durability assessment and application; Application and development of geared systems technologies; Management of transmission designers and manufacturers; and supply of components and sub-systems to mechanical power transmission system manufacturers.

Course Description
Gain a solid and fundamental understanding of gear geometry, types and arrangements, and design principles. Starting with the basic definitions of gears, conjugate motion, and the Laws of Gearing, learn the tools needed to understand the inter-relation and coordinated motion operating within gear pairs and multi-gear trains. Basic gear system design process and gear measurement and inspection techniques will also be explained. In addition, the fundamentals of understanding the step-wise process of working through the iterative design process required to generate a gear pair will be reviewed. Learn the steps and issues involved in design refinement and some manufacturing considerations. An explanation of basic gear measurement techniques, how measurement equipment and test machines implement these techniques, and how to interpret the results from these basic measurements will also be covered.

It is recommended that you spend a minimum of 1 hour reading and reviewing the material each day.

Learning Objectives
• Describe the measurement and inspection techniques used to qualify a gear
• Explain the major contributing factors to gear quality
• Describe in detail the practical gear measurement and inspection techniques
• Categorize the common tools and equipment used to measure and inspect gears
• Discuss some of the new and automated gear design systems

Required Textbook
Textbook will be provided by AGMA.
### COURSE OUTLINE

#### DAY ONE
- **Principles of Gears**
  - Purpose of gears
  - Basic concepts -- Law of gearing; common tooth forms
  - Classification of gears
  - Definitions and terms used in gearing
  - Velocity ratio
  - Pitch surfaces
- **Gear Tooth Action**
  - Conjugacy
  - Profile curves
  - Surface of action
  - Profile sliding
- **Gear Geometry and Nomenclature**
  - Principle of planes
  - Tooth nomenclature
  - Blank nomenclature

#### DAY THREE
- **Gear Geometry and Nomenclature continued**
  - Principle of planes
  - Tooth nomenclature
  - Blank nomenclature
- **Gear Arrangements**
  - Simple gear train
  - Compound gear train -- ratios
  - Epicyclic -- configurations (solar, planetary, star); ratios; tooth number selection and build requirements; application
- **Preliminary Design Considerations**
  - Gear type selection
  - Preliminary estimate of size
  - Stress formulations
  - Gear Drawing Data
DAY TWO
  • Gear System Design Process
    o Calculation of gear tooth data
    o Gear rating practice
  • Gear Design Process
    o Layout
    o Root geometry
    o Backlash
  • Gear Measurement and Inspection
    o Dimension over pins
    o Pin diameter
    o Modify pin diameter and dimension over pins
    o Pin contact point
    o Charts - involute; lead; red liner
    o Dimension sheet
  • Gear Design Systems and Best Practices
    o Common proportions
    o Interchangeability
    o Tooling considerations
    o Mounting considerations
    o Best practices
    o Application

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.

STUDENT FEEDBACK AND GRADING PROCEDURES

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

COURSE MANAGEMENT

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, Director, blassingame@agma.org or Kellyanne Broom, Coordinator, broom@agma.org.

Plagiarism, Cheating and other types of Misconduct
Plagiarism\(^1\), 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 Kellyanne Broom at broom@agma.org. She can be reached at 703-838-0069.

Grievance Procedures
Students who have concerns about the class are encouraged to contact Casandra Blassingame, Director of Education 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.

### LEARNING AND OTHER RESOURCES

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/](https://www.agma.org/newsroom/jobs/)

Industry News:
- [https://www.agma.org/newsroom/industry-news/](https://www.agma.org/newsroom/industry-news/)

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\(^1\) 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."