215: Gearbox System Design

The Rest of the Story...Everything But the Gears & Bearings

INSTRUCTORS:
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COURSE INFORMATION

Course Description
This course focuses the supporting elements of a gearbox that allow gears and bearings to do their jobs most efficiently. Learn about seals, lubrication, lubricants, housings, breathers, and other details that go into designing gearbox systems.

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

Course Rationale/Students Course Designed to Serve
Gear design engineers; management involved with the design and manufacture of gearing type components; metallurgists and materials engineers; laboratory technicians; quality assurance technicians; furnace design engineers; and equipment suppliers.

Learning Objectives

- Describe types of housing construction, housing elements (covers, inspection ports, sump, mounting, etc.)
- Apply drawing practices for housings and related components
- Bearing mounting, retention and sealing
- Describe election and role of gearbox accessories, such as breathers, filters, screens, sight gages, and other level indication devices
- Apply the appropriate lubricant selection
- Apply the lubricant to the rotating elements
- Describe the selection criteria concerning the basic lubricant chemistry
- Discuss drawing practices and tolerancing from the designers' perspective
- Learn about translating the general design from the design manual to the individual component drawings.

Required Textbooks (Provided by MPMA)
MPMA's *Gearbox System Design* by Raymond J. Drago and Steve Cymbala

COURSE OUTLINE

1. **History**
   A general overview on types of gearboxes

2. **Gearbox Function and Layout**
   An exploration of the gearbox in the power transmission environment. Discover the best

location of the gearbox for various uses; preparation of detailed design layout of gearboxes; and review detailed drawings to get to know all the various parts within a gearbox.

3. **Gearbox Style**
   An overview of the various components within gearboxes: open gearbox, arrangement, type of gearing, type of support, lubrication, enclosed gearbox arrangement, and types of gearing will be explored.

4. **Lubrication**
   An introduction to the wide variety of choice in lubrication for gearboxes. Learn thresholds of each type, methods of applications; and maintenance of cleanliness of lubricant. Instructor will provide details on gearbox breathers, oil level indicators, heat exchangers, operation monitoring instrumentation, health monitoring and instrumentation, oil analysis, and vibration sensors.

5. **Gearbox Housing, Cover and Sump Design**
   A lesson in setting up your drawings for various parts of the gearbox. Separate drawings should be prepared for machining, casting, weldment, and other techniques used to produce the final product. Drawings should always utilize Geometric Dimensioning and Tolerancing (GD&T). Additional discussion on housing types, shaft seals, lip seals, packing, split seals, pressure lubrication of gear meshes and bearings, cast oil passages integral with housing and inspection ports.

6. **Gearbox Marking/Identification**
   A list of the various nameplates and markings used when completing gearboxes.

7. **Gearbox Accessories**
   There are small parts that have small roles that are still important in the ultimate functionality of a gearbox. A discussion of breathers, caps, vibration monitoring, lube sample ports and drain ports, is included here.

8. **Provisions for Preservation**
   Once all the hard work is complete - you need to learn how to package your gearbox to transport and complete.

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.

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 our Education inbox at education@motionpower.org. Or we can be reached by calling 703-684-0211.

Grievance Procedures
Students who have concerns about the class are encouraged to contact any Education Department staff at education@motionpower.org or by calling 703-684-0211.

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/

Industry News:

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

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."