

ME 3180 Mechanical Design and Analysis (Either ME 3180 or ME 4315 is required)

Catalog Description: ME 3180 Machine Design (3-0-3)
Prerequisites: ME 2110 Creative Decisions and Design and COE 3001 Mechanics of Deformable Bodies
The analysis, selection, and synthesis of machine components, as applied to springs, bearings, shafts, gears, fasteners, and other elements in a mechanical system.

Textbook: Richard G. Budynas and J. Keith Nisbett, *Shigley's Mechanical Engineering Design*, 9th Edition, McGraw-Hill, 2011.

Topics Covered:

1. Review of static failure mechanisms in the context of machine design.
2. Fatigue failure mechanisms.
3. Spring design.
4. Joining and fastening methods.
5. Shafts, keys, and couplings.
6. Bearings and lubrication.
7. Gear trains.
8. Spur gears.
9. Helical, bevel, and worm gears.
10. Optional topics including system design and optimization, design with microcomputers, computer-based methods, and projects.

Course Outcomes:

Outcome 1: To teach students how to apply the fundamentals of engineering science to analyze and design commonly used mechanical components to meet specifications.

- 1.1 Students will demonstrate the ability to apply fundamentals of engineering science to make proper assumptions, perform correct analyses, and draw upon different mechanical engineering subject areas in the analysis of bolted joints, shafts, bearings, springs, gears, and other components covered.
- 1.2 Students will demonstrate the ability to design mechanical components using the analyses mentioned above.

Outcome 2: To enable students to learn how to identify and quantify the specifications and trade-offs for the selection and application of components that are commonly used in the design of complete mechanical systems.

- 2.1 Students will demonstrate the ability to take technical, economical, safety, quality, and other issues (such as environmental) into account when selecting and/or designing mechanical components. The breadth and depth of the issues taken into account by students are measurable indicators of their performance.

Outcome 3: To illustrate to students the variety of mechanical components available and emphasize the need to keep learning.

- 3.1 Students will demonstrate the ability to seek and learn new material outside the class topics through the completion of open-ended tasks including homework, report, term paper, computer assignment, and/or project. The amount and depth of new material identified and used by the student are measurable indicators of the student's performance.

Correlation between Course Outcomes and Student Outcomes:

ME 3180											
	Mechanical Engineering Student Outcomes										
Course Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Outcome 1.1	X		X		X						X
Course Outcome 1.2	X		X		X						X
Course Outcome 2.1	X		X		X			X	X		X
Course Outcome 3.1	X				X		X		X		X

GWV School of Mechanical Engineering Student Outcomes:

- (a) an ability to apply knowledge of mathematics, science and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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