Course alpha, number, title	ME 471 Mechanical Design II
Required or elective	Required
Course (catalog) description	Engineering design of machine elements and mechanical systems. Computer-based analysis in support of design. Design for static and fatigue strength, deflection, and reliability.
Prerequisite(s)	ME 371 and ME 391 and ME 222
Textbook(s) and/or other required material	Budynas, "Shigley's Mechanical Engineering Design", 8th Edition, McGraw-Hill, 2008. Ulrich, "Product Design and Development", 4th Edition, McGraw Hill, 2008.
Class/Lab schedule:	Total Credits: 3 *Lecture/Laboratory/Discussion Hours: 3/0/0*
Topics covered	a. Design Methodology and completion of a Design Test Build project. b. Stress Analysis c. Design for Deflection. & Stiffness d. Materials & Their Properties e. Finite Element Analysis f. Design for Static Strength g. Design for Fatigue Strength h. Optimal Design Methods i. Design of Machine Components j. Shaft, Axle and Spindle Design
Course learning objectives	1. Students can apply integration techniques to determine beam deflections. 2. Students can apply failure theories to determine the strength of mechanical components. 3. Students can apply concept of fatigue to determine the life of mechanical components. 4. Students can apply stress and deflection analysis to design shafts and axles. 5. Students can analyze the stress and deflection of a mechanical system using finite element analysis software and verify the solution using hand calculations. 6. Students can design, build and test a mechanical system as part of a design team. This includes completing all the steps in good product development—determining customer needs, developing product specifications, applying project planning and time management, completing concept generation, analyzing and critiquing design alternatives. It also includes optimizing their designs with respect to performance, cost, weight, and manufacturability. 7. Students can create a formal design report documenting the activities performed in the mechanical design process. 8. Students can present a mechanical design summary as a team in an oral format.
Relationship of course to ME program outcomes	The following measurement standard is used to evaluate the relationship between the course outcomes and the educational-program outcomes: 3 = Strong Emphasis, 2 = Some Emphasis, 1 = Little or No Emphasis. (a) an ability to apply knowledge of mathematics, science, and engineering—3 (b) an ability to design and conduct experiments, as well as to analyze and interpret data—2 (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—3 (d) an ability to function on multidisciplinary teams—3 (e) an ability to identify, formulate, and solve engineering problems—3 (f) an understanding of professional and ethical responsibility—2 (g) an ability to communicate effectively—2 (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context —1 (i) a recognition of the need for and the ability to engage in life-long learning—1 (j) a knowledge of contemporary issues—1 (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice—3

	(l) application of advanced mathematics—1 (m) design, build, and test in mechanical systems area—3 (n) design, build, and test in thermal/fluids area—1 (o) capstone design experience—2
Contribution to professional component:	33% Engineering Science 67% Engineering Design
Person(s) who prepared this description	Scott Kiefer and Farhang Pourboghrat
Date of Preparation	November 9, 2009