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**EML 4501**  
**MECHANICAL DESIGN II**

**Fall 2009**

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**[www.eng.fiu.edu/mme/robotics](http://www.eng.fiu.edu/mme/robotics)**

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**Catalog Description:**

EML 4501 Mechanical Design II (3). Continuation of design analysis of elementary machine elements, including lubrication bearings, and gearings. Introduction to advanced analysis techniques.

**Prerequisite:**

EML 3500 Mechanical Design I.

**Lectures:**

M 4:00-4:50 pm, W 3:00-4:50 pm, EC 1115.

**Office Hours:**

MW 5:00-6:00 pm. For other times, appointment by e-mail is recommended.

**Text Book:**

*Shigley's Mechanical Engineering Design*, Richard G. Budynas, and Charles R. Mischke, 8th edition, McGraw-Hill, Inc., New York, 2008. ISBN 978-0-07-312193-2.

**Course Objectives:**

1. This course presents a review of mechanical elements such as gears, ball and journal bearings, belts, brakes, and so on.

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2. Ball bearing design, selection of ball and cylindrical bearings, deep groove ball bearings, roller bearings. Journal bearings. Bearing characteristic number. Use of Raimondi-Boyd charts.
  3. Introduction to gear geometry and reaction forces. Gear trains. Traditional and epicyclic gear trains. Spur, helical, bevel and worm gears. Design of spur and helical gears using AGMA procedure. Review of bevel and worm gear selection procedure.
  4. Open-ended design project to integrate various components.

**ABET MME Program Outcomes Supported by the Course:**

- (a) Ability to apply knowledge of mathematics including statistics, multivariable calculus and differential equations, science including physics, and engineering
- (c) Ability to design a system, component, or process to meet desired needs.
- (d) Ability to function on multi-disciplinary teams.
- (e) Ability to identify, formulate, and solve engineering problems.
- (f) Understanding of professional and ethical responsibility.
- (g) Ability to communicate effectively.
- (i) Recognition of the need for, and ability to engage in life-long learning.
- (j) Knowledge of contemporary issues.
- (k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

**Note regarding ABET MME Objectives and Outcomes:** ABET program objectives and outcomes are defined for the MME program that must be achieved by graduating students. Each course supports several of the objectives and outcomes incrementally but must not necessarily achieve them fully.

**Course Outline:**

**Chapter**

1. Rolling Contact Bearings	11
2. Journal Bearings	12
3. Introduction to Gears	13
4. Spur Gears	14

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5. Helical Gears	14
6. Clutches, Brakes, Couplings and Flywheels	16
7. Flexible Elements: Belts and Chains	17

### **Grading Policy:**

<u>Activity</u>	<u>Percentage</u>
Attendance	5%
Quizzes	15%
Exam 1 (Chapters 11 and 12)	15%
Exam 2 (Chapters 13 and 14)	15%
Project 1 (Team project with video presentation)	10%
Project 2 (Individual project with open-ended design)	20%
Final (Comprehensive: All material included)	20%

### **Exams:**

Exams and quizzes will be open book. One letter-size sheet of formulas is allowed in each midterm; a total of three pages during the final exam. Class notes and problem solutions will not be allowed. Textbooks, formula sheets or calculators cannot be shared during the exams or quizzes.

### **Make-up Exams:**

Make-up exams will be allowed only after the student provides a medical doctor's original report describing the problem and a statement that it was an emergency. The report must include the doctor's address and phone number. The Department will contact and verify the situation before a test day is scheduled.

### **Problem Assignments and Quizzes:**

Problem assignments will be posted at the course web site. Solutions will not be collected in the form of homework assignments, but unannounced quizzes based on assignment problems will be given in class. Expect at least one quiz per week. Solutions of assigned problems will be posted at the course site.

IMPORTANT: No make-ups will be offered for quizzes as it is extremely impractical to do so. The lowest quiz grade will be dropped. If you miss classes more than once, please be prepared to miss a quiz and receive a "0" grade as a result.

### **Late Projects:**

Project due dates will be strictly enforced. Late project submissions will not receive full credit, and the following policy will apply: Submissions after the class hour on due date

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or the following day will lose 10 points out of 100. Submissions on the second or third day after the due date will lose 10 additional points each day.

**Ethics:**

All work prepared and submitted in this course in the form of projects, presentations, problem solutions in quizzes and exams are expected to be original and produced by the submitting student. Any portion that may have been borrowed from a previous work must be clearly identified and referenced to indicate the original author along with the title of the work, and where and when it appeared. It is extremely important to realize that not doing so may result in an accusation of plagiarism.

Projects must contain the following statement and include student's signature:

Author's Statement:

The work submitted in this project is solely prepared by NAME LASTNAME, and it is original. Excerpts from others' work have been clearly identified and listed in the list of references. All of the engineering drawings, computer programs, formulations and related files submitted on the accompanying CD are also original and prepared by NAME LASTNAME.

NAME LASTNAME

(Include Signature)

**Policy on Incomplete Grade:**

A grade of "Incomplete" will not be assigned to replace an unwanted grade. In order to be eligible to receive "Incomplete," only a single component of the entire coursework needs to be missing. The reason for failure to fulfill the requirement in time must be officially proved by the student (e.g., a medical doctor's official letter), and verified by the Department in order to receive an "Incomplete" grade.

The University requires that a student must fill out an "Incomplete Grade Form" before the incomplete grade is assigned. This University policy and the related form are printed below.

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### **Policy for Assigning an Incomplete "I" Grade**

An incomplete grade is a temporary symbol given at the discretion of the instructor for work not completed because of serious interruption not caused by the student's own negligence. An incomplete must be made up as quickly as possible but no later than two consecutive semesters after the initial taking of the course or it will automatically default to an "F" or the grade that the student earned in the course. There is no extension of the two semester deadline. The student must not register again for the course to make up the incomplete. Students who have incomplete grades on their records must remove the incomplete by the end of the fourth week of the term in which they plan to graduate. Failure to do so will result in a cancellation of graduation .

In such cases where the course instructor determines that it appropriate to award a student a grade of "I" (incomplete) the following steps must be followed.

Using an Official University Form the course instructor will report the following:

1. The grade earned by the student to date
2. The missing work and the percentage of the final grade it represents (this requires the details of the specific missing assignment)
3. The date the instructor expects the missing work to be submitted or in the case of an examination made up
4. The justification for awarding the grade of "I"
5. Have the student sign the form
6. Submit this form to the Department Chair and Dean and maintain a copy for instructor records and provide a copy for the student
7. Upon satisfying the requirements for a grade the instructor will sign off on the form and attach it to the change of grade form she or he will submit.

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### Incomplete Grade Form

Student Name: \_\_\_\_\_ Panther ID: \_\_\_\_\_

Course Number: \_\_\_\_\_ Section Number: \_\_\_\_\_

Date: \_\_\_\_\_ Grade earned to date: \_\_\_\_\_

Specific missing assignments:

Percent of grade based on missing assignments: \_\_\_\_\_

Date by which missing assignments will be submitted: \_\_\_\_\_

Justification for assigning an I:

\_\_\_\_\_  
Professor Date Student Date

Copies to: Professor, Student, Department Chair, Dean

Final Grade \_\_\_\_\_ based on all work completed.

\_\_\_\_\_  
Professor Date

Copies to: Professor, Department Chair, Dean, Registrar