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**EML 3500**  
**MECHANICAL DESIGN I**  
**ONLINE COURSE**

**Summer 2011**

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

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<b>ONLINE RESOURCES</b>
FIU Online Login: <a href="http://online.fiu.edu/login">http://online.fiu.edu/login</a>
McGraw Hill Connect: <a href="http://connect.mcgraw-hill.com">http://connect.mcgraw-hill.com</a> EML 3500: <a href="http://connect.mcgraw-hill.com/class/s_tosunoglu_summer_2011_2">http://connect.mcgraw-hill.com/class/s_tosunoglu_summer_2011_2</a>
Supplemental Problems: <a href="http://www.eng.fiu.edu/mme/robotics/EML3500MechDesignI/">http://www.eng.fiu.edu/mme/robotics/EML3500MechDesignI/</a>
Correspondence: <a href="mailto:fiumechdesign@gmail.com">fiumechdesign@gmail.com</a>

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**Course Description:**

Introduction to design process. Review of static and dynamic loading, resulting normal and shear stresses, principal stresses. Engineering materials, static and fatigue failure theories. Machine element design including screws, bolts, fasteners, welded joints. Open-ended design projects.

**Prerequisites:**

EGN 3321 Dynamics,  
EMA 3702 Mechanics and Materials Science, and  
EGN 3365 Materials in Engineering.

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### Textbook:

*Shigley's Mechanical Engineering Design*, Richard G. Budynas, and J. Keith Nisbett, Ninth Edition, 9e, McGraw Hill, 2011, ISBN (Provided by McGraw Representative – Students will get free access card by using this ISBN): 9780077942908.

### Contact for Questions:

All correspondence will be via email address [fiumechdesign@gmail.com](mailto:fiumechdesign@gmail.com).

### Lectures:

Online course. There are no on-campus lectures; however, three on-campus exams will be given as outlined below.

### On-Campus Exams and Online Quizzes:

**On-campus exams will be given on Wednesdays between 2:00 pm – 4:00 pm.**

**Online quizzes will be given Wednesdays between 2:00 pm – 3:00 pm.**

Online Quiz 1	Wednesday, May 18
Online Quiz 2	Wednesday, May 25
On-Campus Midterm Exam 1 (Chapters 1, 2, 3) Room: EC 3239 (50 seats)	Wednesday, June 1
Online Quiz 3	Wednesday, June 8
Online Quiz 4	Wednesday, June 15
Online Quiz 5	Wednesday, June 23
On-Campus Midterm Exam 2 (Chapters 4, 5, 6, 7) Rooms: EC 2807 (12 seats), EC 2830 (12) and EC 2836 (12)	Wednesday, June 29
Online Quiz 6	Wednesday, July 6
Online Quiz 7	Wednesday, July 13
Online Quiz 8 and 9 (Practice Final Exam; Chapters 1 through 9)	Wednesday, July 20
On-Campus Comprehensive Final Exam (Chapters 1 through 9) Rooms: EC 2807 (12 seats), EC 2830 (12) and EC 2836 (12)	Wednesday, July 27

### Course Outline:

Part I Basics: Brief Review of Mechanics of Materials

1. Introduction to Design, Ethics
2. Materials
3. Load and Stress Analysis
4. Deflection and Stiffness

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## Part II Failure Prevention: Design Theories

5. Failures Resulting from Static Loading
6. Fatigue Failure Resulting from Variable Loading

## Part III Design of Mechanical Elements

7. Design of Shafts
8. Screws, Fasteners, and the Design of Nonpermanent Joints
9. Welding, Brazing, Bonding and the Design of Permanent Joints

### Course Objectives:

- This course presents a review of the concepts on stress, strain, elastic and plastic ranges of material behavior, stress-strain relationship, and engineering materials.
- Stress calculations under axial loading, torsion, bending, and transverse loading. Brief review of deflection analysis.
- Static failure theories for ductile and brittle materials: Maximum shear stress theory, Maximum normal strain theory, Distortion energy (von Mises) theory; Maximum normal stress theory, Coulomb-Mohr theory, modified Coulomb-Mohr theory.
- Fatigue failure theories such as Gerber, Soderberg, Goodman, and modified Goodman for cyclic loading.
- Application of static and dynamics failure theories to mechanical design problems.
- Permanent and temporary joints. Welding, bolts and screws, welding groups and bolt groups. Mechanical springs.

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

MME departmental program outcomes that are supported by this course are as follows:

- (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.

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- (f) Understanding of professional and ethical responsibility.
  - (g) Ability to communicate effectively.
  - (k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

**Note Regarding ABET MME Outcomes:**

ABET program outcomes are defined for the MME program that must be achieved by graduating students. Each course supports several of the outcomes incrementally but must not necessarily achieve them fully.

**Grading:**

<b>Activity</b>	<b>Percent</b>	<b>Comment</b>
Online Participation	10%	As monitored through FIU Online System: Online Practice Problems, Participation in Discussion Board and Blogs.
Online Quizzes	10%	The lowest quiz grade will be dropped.
Project 1	10%	<u>Both projects require Senior Design Report format.</u> Team project: Technical report, PowerPoint file, team presentation movie.
Project 2	10%	Team project. Structural mechanical design, professional engineering drawings, technical report. <u>Important: If Project 2 is not submitted, course grade will directly be F.</u>
On-Campus Exam 1	10%	Open book only. 1 page of formula sheet allowed.
On-Campus Exam 2	20%	Open book only. 2 pages of formula sheets allowed.
On-Campus Final Exam	30%	Open book only. 3 pages of formula sheets allowed. Final is a comprehensive exam.

**Exam Policy:**

During the exams, a personal calculator may be used. See the calculator policy below.

Laptops, computers, phones, mp3 players or any electronic device will not be allowed.

Lecture notes, PowerPoint files and problem solutions will not be allowed.

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No material or calculator may be shared by students.

Individually-prepared one letter-size sheet of formulas will allowed in the first midterm exam, two sheets in the second midterm and three sheets in the final exam.

### **Calculator Policy:**

Only the following calculators will be allowed during exams and quizzes:

- Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name.
- Hewlett Packard: HP 33s and HP 35s models, but no others.
- Texas Instruments: All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

Students can use only their own calculator. No calculator can be shared by students.

### **Correspondence via E-mail:**

Each student is required to provide a reliable “permanent” e-mail address for correspondence. Various announcements and reminders will be sent via e-mail throughout the semester.

Students are expected to check their e-mail regularly and make sure their inboxes are not full as the bounced mail messages will not be sent again.

All correspondence regarding this course will be conducted through the following email address: [fiumechdesign@gmail.com](mailto:fiumechdesign@gmail.com). Messages sent to other mail addresses may not be monitored and students may not receive any response.

### **Online Practice Problem Assignments and Online Quizzes:**

Online practice problem assignments will be posted at the course web site. Students are required to solve these problems to practice the theory introduced in lectures and textbook. Hence, these problems will prepare the students for quizzes and midterms.

Online quizzes will also be given regularly. Timeframe allowed to solve the problem, permitted number of trials and hints provided will be limited relative to the practice problem assignments.

At the end of the semester, the lowest quiz score and the lowest practice problem assignment score will be dropped.

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### **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.

No make-up will be provided for missed quizzes under any circumstance. If a student misses a quiz, he/she should be prepared to receive a 0 score as a result.

### **Incomplete Grades:**

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. The form will be signed by the student and the professor before such grade is assigned.

### **Academic Misconduct:**

Academic dishonesty is a serious offense and will be treated according to the University policy as outlined below.

Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, rigorous and respectful exchange of ideas, and community service.

All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University.

All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

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## 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. The origin of each figure, photograph, table as well as text used from other sources must be clearly identified.

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 Ethics 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 work submitted are also original and prepared by NAME LASTNAME.

NAME LASTNAME

(Include Signature)

For team-based reports use the following format:

Authors' Ethics Statement:

The work submitted in this project is solely prepared by NAME\_LASTNAME\_1, NAME\_LASTNAME\_2, NAME\_LASTNAME\_3, 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 work submitted are also original and prepared by the authors.

NAME\_LASTNAME\_1

NAME\_LASTNAME\_2

NAME\_LASTNAME\_3

(Signature1)

(Signature2)

(Signature3)

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## SUMMARY OF EML 3500 ONLINE COURSE ACTIVITIES IN SUMMER 2011

The schedule of activities of the online course is summarized in the following table. Major components include lecture videos, practice problem assignments, quizzes, projects, midterm exams and final exam.

- **Lecture videos** for each chapter will remain online for one week; posted on Monday at 2:00 pm and removed the following Monday at 2:00 pm.
- **Practice problem assignments** will also be posted on the same day and time as the lecture videos. Multiple trials and hints will be allowed, and the activity monitored online.
- **Quizzes** will cover the material posted earlier. This may include the latest chapter posted or the previous chapters posted earlier. Quizzes must be completed between 2:00 pm and 3:00 pm on the days announced in the table below. Number of trials will be limited and no hints will be provided.
- **Midterms** will be structured similar to the quizzes but they will span 2 hours between 2:00 pm and 4:00 pm on the exam days as listed below. Note that both midterm exams and the final exam will be taken on-campus.
  - Midterm exam will cover Chapters 1 through 3 (included).
  - Midterm exam 2 will cover Chapters 4 through 7 (included).
  - Final exam will be comprehensive (Chapters 1 through 9).
- **Projects 1 and 2** are team based. Assignment and due dates are as listed in the activity table.

**Project 1.** The first project is a survey, and requires technical report and PowerPoint file preparation as well as a team presentation which will be recorded and the movie file will be submitted.

**Project 2.** The second project involves structural design and analysis, and the use of static and fatigue failure theories for a realistic mechanical design problem. The design will be submitted in formal Senior Design Report format. Teams that do not turn in this project will directly be assigned F.

**EML 3500 ONLINE COURSE SUMMER 2011  
ACTIVITIES**

**Three on-campus exams shown below will be given on Wednesdays 2:00 – 4:00 pm.  
All online quizzes shown below must be taken on Wednesdays 2:00 am – 3:00 pm.  
Mondays are shown below to indicate the beginning of weeks.**

Week	Date	Activity	Post - Time	Remove - Time
<b>1</b>	Monday, May 9	Chapter 1: Intro to Design Chapter 2: Materials	5/9 – 2:00 pm	5/16 – 2:00 pm
	Monday, May 9	Project 1 Assigned	5/9 – 2:00 pm	
	Wednesday, May 11	Review Chapters 1 and 2		
<b>2</b>	Monday, May 16	Chapter 3: Stress Analysis: Axial Loads, Torsion	5/16 – 2:00 pm	5/23 – 2:00 pm
	Wednesday, May 18	Online Quiz 1	5/18 – 2:00 pm	5/18 – 3:00 pm
<b>3</b>	Monday, May 23	Chapter 3 (cont): Stress Analysis: Bending Moment, Shear Force, and Principal Stresses	5/23 – 2:00 pm	5/30 – 2:00 pm
	Monday, May 23	Project 1 Due by 5:00 pm		
	Monday, May 23	Project 2 Assigned	5/23 – 2:00 pm	
	Wednesday, May 25	Online Quiz 2	5/25 – 2:00 pm	5/25 – 3:00 pm
<b>4</b>	Monday, May 30	Memorial Day Chapter 4: Deflection Analysis	5/30 – 2:00 pm	6/6 – 2:00 pm
	Wednesday, June 1	On-Campus Midterm Exam 1 (Chapters 1, 2 and 3) Room: EC 3239 (50 seats)	6/1 – 2:00 pm	6/1 – 4:00 pm
<b>5</b>	Monday, June 6	Chapter 5: Static Failure Theories – Brittle Materials	6/6 – 2:00 pm	6/13 – 2:00 pm
	Wednesday, June 8	Online Quiz 3	6/8 – 2:00 pm	6/8 – 3:00 pm
<b>6</b>	Monday, June 13	Chapter 5: Static Failure Theories – Ductile Materials	6/13 – 2:00 pm	6/20 – 2:00 pm
	Wednesday, June 15	Online Quiz 4	6/15 – 2:00 pm	6/15 – 3:00 pm
<b>7</b>	Monday, June 20	Chapter 6: Fatigue Failure Theories	6/20 – 2:00 pm	7/4 – 2:00 pm
	Wednesday, June 22	Online Quiz 5	6/22 – 2:00 pm	6/22 – 3:00 pm
<b>8</b>	Monday, June 27	Chapter 7: Design of Shafts	6/27 – 2:00 pm	7/4 – 2:00 pm
	Wednesday, June 29	On-Campus Midterm Exam 2 (Chapters 4, 5, 6, 7) Rooms: EC 2807 (12 seats), EC 2830 (12) and EC 2836 (12)	6/29 – 2:00 pm	6/29 – 4:00 pm
<b>9</b>	Monday, July 4	Independence Day Chapter 8: Nonpermanent Joints: Screws and Fasteners	7/4 – 2:00 pm	7/11 – 2:00 pm
	Wednesday, July 6	Online Quiz 6	7/6 – 2:00 pm	7/6 – 3:00 pm

<b>10</b>	Monday, July 11	Chapter 8: Nonpermanent Joints: Screws and Fasteners	7/11 – 2:00 pm	7/18 – 2:00 pm
	Wednesday, July 13	Online Quiz 7	7/13 – 2:00 pm	7/13 – 3:00 pm
<b>11</b>	Monday, July 18	Chapter 9: Permanent Joints: Welding	7/18 – 2:00 pm	7/27 – 2:00 pm
	Monday, July 18	Project 2 Due by 5:00 pm		
	Wednesday, July 20	Online Quiz 8 & 9 (Online Practice Comprehensive Final Exam; Chapters 1 through 9)	7/20 – 2:00 pm	7/20 – 4:00 pm
<b>12</b>	Monday, July 25	Review Chapters 1 through 9		
	Wednesday, July 27	On-Campus Comprehensive Final Exam (Chapters 1 through 9) Rooms: EC 2807 (12 seats), EC 2830 (12) and EC 2836 (12)	7/27 – 2:00 pm	7/27 – 4:00 pm