

Course Syllabus

EML3005 - Mechanical Engineering Design 1

Instructor

Dr. Katerina E. Aifantis

Office hours: Monday, Wednesday, 11.30-13.30

Office: 135 NEB (New Engineering Building)

Email: kaifantis@ufl.edu

Zoom link: <https://ufl.zoom.us/j/4855871400> (used for office hours)
and)

Class

Periods: M, W, F | Period 7 (13:55 - 14:45)

Room: WEIM 1064

Textbook: Not required to purchase, but will be using content from Shigley's mechanical engineering design, 10th edition

Prerequisites: COP 2271, EML2322L and EGM 3520 with minimum grade of C.

Teaching Assistants

Dr. Bo Wang

Location: 158 NEB (New Engineering Building)

Email: wangbo@ufl.edu

Course Description

This course deals with the design of mechanical components that are found in mechanical systems, e.g. shafts, fasteners, bearings, springs, gears, brakes, clutches, couplings. From catalog: design process, kinetics gear, gear trains, and standard mechanical components.

Evaluation

3 Exams @ 19% each	57%
Final Exam	23%
Homework	20%

Important Dates:

Jan 9	First class
Jan 16	MLK day, No class
Feb 8	Exam 1
Mar 11-19	Spring break
Mar 22	Exam 2
Apr 5	Exam 3
Apr 21	Exam 4

Homework schedule

HW1	1/13 – 1/20
HW2	1/23 – 1/30
HW3	2/1 – 2/12
HW4	2/15 – 2/22
HW5	3/1 – 3/8
HW6	3/20 – 3/27
HW7	4/10 – 4/17

Tentative content

(The instructor may change this schedule to accommodate class needs.)

Chap 1 - Introduction

Chap 2 - Materials

Chap 3 - Load and Stress Analysis

Chap 4 - Deflection and Stiffness

Chap 5 - Static failure
Chap 6 - Fatigue failure
Chap 7 - Shafts
Chap 8 - Fasteners and Screws
Chap 10 - Mechanical Springs
Chap 11 - Rolling-Contact Bearings
Chap 13 – Gears Design
Chap 14 - Spur and Helical Gears
Chap 16 - Clutches, Brakes

Tentative schedule for Spring 2023

(The instructor may change this schedule to accommodate class needs.)

1/9/23	<i>Introduction</i>
1/11/23	<i>Material properties; Stress, Mohr's circle. Section 2.1, 3.4-3.7</i>
1/13/23	<i>Stress for bending and Torsion; Stress concentration. Section 3.10-3.13</i>
1/16/23	<i>Holiday, no class</i>
1/18/23	<i>Deflection, strain energy and Castigliano's theorem. Section 4.1 – 4.8</i>
1/20/23	<i>Failure of ductile material from statics loading. Section 5.1-5.7</i>
1/23/23	<i>Failure of brittle material from statics loading. Section 5.8-13</i>
1/25/23	<i>Fatigue and fatigue-life method. Section 6.1-6.6</i>
1/27/23	<i>Fatigue and fluctuating stresses. Section 6.11-6.15</i>
1/30/23	<i>Shaft Materials, layout and design for stress. Section 7.1-7.4</i>
2/1/23	<i>Shaft design for stress, deflection and critical speeds. Section 7.4-7.6</i>
2/3/23	<i>Threads; Power screw; Fastener stiffness. Section 8.1-8.4</i>

2/6/23	<i>Member stiffness; Bolt strength and tensile.</i> Section 8.5-8.8
2/8/23	Exam 1
2/10/23	<i>Loading Joint.</i> Section 8.9-8.12
2/13/23	Welding and stresses in welded joints. Section 9.1-9.4
2/15/23	Fastener stiffness; Member stiffness (chap. 8)
2/17/23	Tension joints; statically loaded tension joint (chap. 8)
2/20/23	Fatigue loading of tension joints (chap. 8)
2/22/23	Welding symbols; stress in welded joints in torsion and bending (chap. 9)
2/24/23	Strength of welded joints and static loading (chap. 9)
2/27/23	Fatigue loading and bonding (chap. 9)
3/1/23	Stresses in spring; curvature effect; deflection (chap.10)
3/3/23	Compression springs; stability. (chap. 10)
3/6/23	Critical frequency; fatigue loading (chap. 10)
3/8/23	Review
3/10/23	Exam 2
3/11/23 – 3/19/23	Spring break, no class
3/20/23 (chap.13)	Types of gears; fundamentals
3/22/23	Contact ratio; forming of gear teeth. (chap. 13)
3/24/23	Worm gears; tooth system; gear trains. (chap. 13)
3/27/23	Force analysis (chap. 13)
3/29/23	Force analysis (chap. 13)
3/31/23	Lewis bending equation; AGMA equations (chap. 14)
4/3/23	Stress-cycle factor; safety factors (chap. 14)
4/5/23	Exam 3

4/7/23	Mech Design for Batteries
4/10/23	Stress-cycle factor; safety factors (chap. 14)
4/12/23	Stress-cycle factor; safety factors (chap. 14)
4/14/23	Geometry factors; dynamics factor; overload factor (chap.14)
4/17/23	Geometry factors; dynamics factor; overload factor (chap.14)
4/19/23	Makeup for evening exam 1
4/21/23	Exam 4
4/24/23	Makeup for evening exam 3
4/26/23	Makeup for evening exam 4

Grading scale

95-100	A
90-94.9	A-
87-89.9	B+
83-86.9	B
80-82.9	B-
77-79.9	C+
73-76.9	C
70-72.9	C-
67-69.9	D+
63-66.9	D
60-62.9	D-
<60	E

Homework policy

Homework is due at the beginning of class on the due date. The homework schedule is tentatively shown within the course outline. However, since the course schedule for each topic is dependent on class progress, the due date for each homework assignment is subject to change. Any homework changes will be posted on the Canvas class website. Students are responsible for checking Canvas and university email on a regular basis.

Attendance, Make-up policy

Students are expected to attend all lectures, and to utilize office hours as needed. The instructor, at her discretion, may decide to consider late arrivals or early departures as full absences. A two-week absence may result in administrative withdrawal. If you need to be absent from the class for justifiable reasons (sickness, family obligations, etc.), you must inform the instructor in advance or immediately after the day of absence. If a student misses a class, he/she is responsible for all announcements and subjects covered in that class. If in doubt, contact the instructor.). The university policies on attendance and make-up work, including acceptable excuses can be found

at <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> [Links to an external site.](#)

Disability Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/ [Links to an external site.](#)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluations

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu> [Links to an external site.](#) Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>. [Links to an external site.](#)

Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honorcode/> [Links to an external site.](#)) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Student Privacy

There are federal laws protecting your privacy regarding grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html> [Links to an external site.](#).

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Health and Wellness

- U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.
- Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.
- Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161.
- University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.