

EML3005 - Me Design 1

IEML3005 - Mechanical Engineering Design 1

EML3005-3284(26139)

Class Periods: M, W, F | Period 10 (5:10 PM - 6:00 PM)

Location: LAR0239

Academic Term: Fall 2022

Instructor:

Associate Professor Katerina E. Aifantis

kaifantis@ufl.edu

(352) 392-6227

Office Hours: M-W 6:00pm-7pm, and by appointment

Zoom link: <https://ufl.zoom.us/j/4855871400>

Office NEB158

Teaching Assistang

James Beard <jbeard1@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

Course Pre-Requisites / Co-Requisites

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

Course Objectives

At the end of the course, the student should

- Understand how to design using the “design process”
- Be able to determine stresses in mechanical elements
- Be able to design elements to avoid failure from static and dynamic loading within some factor of safety

Materials and Supply Fees

Not applicable

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to communicate effectively with a range of audiences	High
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- Shigley's mechanical engineering design
- Richard Budynas, Keith Nisbett
- 2014, 10th edition
- 0073398209, 9780073398204

Homework schedule:

HW1	9/2 - 9/9
HW2	9/10 - 9/21
HW3	9/28 - 10/8
HW4	10/9 - 10/20
HW5	10/26 - 11/5
HW6	11/6 - 11/16
HW7	11/ 17- 11/28

Course Schedule

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

1. 8/24 Material properties; Stress, Mohr's circle. Section 2.1, 3.4-3.7
2. 8/26 Stress for bending and Torsion; Stress concentration. Section 3.10-3.13
3. 8/29 Deflection, strain energy
4. 8/31 Failure of ductile material from statics loading. Section 5.1-5.7
5. 9/2 Fatigue and fatigue-life method. Section 6.1-6.6
6. 9/7 Fatigue and fatigue-life method. Section 6.1-6.6
7. 9/9 Fatigue and fluctuating stresses. Section 6.11-6.15
8. 9/12 Fatigue and fluctuating stresses. Section 6.11-6.15
9. 9/14 Fatigue and fluctuating stresses. Section 6.11-6.15
10. 9/16 Review

9/19 Exam 1

11. 9/21 Shaft Materials, layout and design for stress. Section 7.1-7.4
12. 9/23 Shaft design for stress, deflection. Section 7.4-7.6
13. 9/26 Threads; Power screw; Fastener stiffness. Section 8.1-8.4
14. 9/28 Member stiffness; Bolt strength and tensile. Section 8.5-8.8
15. 9/30 Loading Joint. Section 8.9-8.12
16. 10/3 Welding and stresses in welded joints. Section 9.1-9.4
17. 10/5 Fastener stiffness; Member stiffness (chap. 8)
18. 10/7 Tension joints; statically loaded tension joint (chap. 8)
19. 10/10 Fatigue loading of tension joints (chap. 8)
20. 10/12 Review

10/14 Exam 2

21. 10/17 Welding symbols; stress in welded joints in torsion and bending (chap. 9)
22. 10/19 Strength of welded joints and static loading (chap. 9)
23. 10/21 Fatigue loading and bonding (chap. 9)
24. 10/24 Fatigue loading and bonding (chap. 9)
25. 10/26 Stresses in spring; curvature effect; deflection (chap. 10)
26. 10/28 Compression springs; stability. (chap. 10)

- 27.10/31 Critical frequency; fatigue loading (chap. 10)
- 28.11/2 Types of gears; fundamentals (chap. 13)
- 29.11/4 Contact ratio; forming of gear teeth. (chap. 13)
- 30.11/7 Worm gears; tooth system; gear trains. (chap. 13)
- 31.11/14 Force analysis (chap. 13)
- 32.11/16 Review

11/18 Exam 3

- 33.11/21 Lewis bending equation; AGMA equations (chap. 14)
- 34.11/28 Lewis bending equation; AGMA equations (chap. 14)
- 35.11/30 Geometry factors; dynamics factor; overload factor (chap. 14)
- 36.12/2 Geometry factors; dynamics factor; overload factor (chap. 14)
- 37.12/5 Review

12/7 Exam 4

Attendance Policy, Class Expectations, and Make-Up Policy

State whether attendance is required and if so, how will it be monitored? What are the penalties for absence, tardiness, cell phone policy, laptop policy, etc. What are the arrangements for missed homework, missed quizzes, and missed exams? This statement is required: Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> (Links to an external site.)) (Links to an external site.)) and require appropriate documentation.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (7)	100 each	20%
3 Exams	100 each	57%
Final Exam	100	23%
		100%

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
95.0 - 100.0	A	4.00
90.0 - 94.9	A-	3.67

87.0 - 89.9	B+	3.33
83.0 - 86.9	B	3.00
80.0 - 82.9	B-	2.67
77.0 - 79.9	C+	2.33
73.0 - 76.9	C	2.00
70.0 - 72.9	C-	1.67
67.0 - 69.9	D+	1.33
63.0 - 66.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> (Links to an external site.) (Links to an external site.)

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/> (Links to an external site.) (Links to an external site.). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/> (Links to an external site.) (Links to an external site.). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/> (Links to an external site.) (Links to an external site.). Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/> (Links to an external site.) (Links to an external site.).

University 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 (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/> ([Links to an external site.](#)) ([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.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

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.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html> (Links to an external site.) (Links to an external site.)

Campus Resources:

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Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc> (Links to an external site.) (Links to an external site.), and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance \(Links to an external site.\) \(Links to an external site.\)](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

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/> ([Links to an external site.](#)) ([Links to an external site.](#))

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml> ([Links to an external site.](#)) ([Links to an external site.](#))

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/> ([Links to an external site.](#)) ([Links to an external site.](#))

Library Support, <http://cms.uflib.ufl.edu/ask> ([Links to an external site.](#)) ([Links to an external site.](#)). Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/> ([Links to an external site.](#)) ([Links to an external site.](#))

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/> ([Links to an external site.](#)) ([Links to an external site.](#))

Student Complaints Campus: <https://care.dso.ufl.edu> ([Links to an external site.](#)) ([Links to an external site.](#))

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process> ([Links to an external site.](#)) ([Links to an external site.](#))

