Mechanical Engineering Design 1
EML 3005, Fall 2021

Instructor: Dr. Andrés Rubiano, MAE-B 307

Office hours: as many as you want. Send me a Canvas message with a "Office Hours" subject and a when2meet availability.

Course Structure:

Before EVERY class meeting, students are to:

- study the one 8-12-minute lecture main video (1-hour worth of lecture content).
- watch the two or three 1-4-minute "additional examples videos" for each lecture topic.
- solve the two or three textbook-style exercises homework assignment.

Students are to attend all lectures. Attendance will be taken, and participation will be noted.

Class meeting times will be used to:

- answer specific questions about lecture videos, example videos, and homework (in that order).
- work on design specific problems.
- take in-class pop-quizzes.

Course Assignments

Homework: There is one homework assignment for every day of class (2-3 textbook-style problems, similar to the video example solutions). Homework assignments will not be graded, but they are essential to properly prepare for class, quizzes, and exams.

Quizzes: Approximately 20 quizzes total; mostly 5-15-minute pop quizzes. Quiz time will appear limited and quiz problems, challenging, if homework assignments are not completed.

Project: Four-person group project. Project updates will be requested randomly and without previous notice between the date of posting and the final submission date.

Exams: There will be 3 [cumulative] night exams.

Grading: Quizzes (25%), Exams (60%), Project (15%).

Course Content and Schedule:

Day	Content	Lecture & Examples
M	Axial Loading Review	https://youtu.be/d-ZriY-TWKI https://youtu.be/9ohoY_PmSvQ https://youtu.be/kQbtpxCqHWg https://youtu.be/fWFfZ1yRdX4
W	Torsion Review	https://youtu.be/Nem1IabOLsk https://youtu.be/Vqqe-_-d_8w https://youtu.be/edmWbZBMsQY https://youtu.be/7L7jOBw6Ptg
F	Pure Bending and Deflection Review	https://youtu.be/KgpxCEKHKmY https://youtu.be/r3iRNeXdYlc https://youtu.be/eCoaYV02KSg https://youtu.be/ivlth7CjbG4

M	Holiday	
W	Pure Bending and Deflection Combined Example	https://youtu.be/SS0lXhKz1M0 https://youtu.be/sRM3sDSGxIw https://youtu.be/oEbhTBdul00
F	Shear and First Moment About Neutral Axis Review	https://youtu.be/ynSo2bXbIX0 https://youtu.be/z4hInwWe_ug https://youtu.be/wgFY9rGLImA https://youtu.be/3TFBSfouOOU
M	Mohr's Circle Review	https://youtu.be/Xc3VzDy5Ik4 https://youtu.be/jYVwxqbFR4Q https://youtu.be/rs55OWpe-oo https://youtu.be/C6yl7vhBy_A
W	Brittle Failure Theories - Fracture Criteria	https://youtu.be/D7aoVr7qzGc https://youtu.be/H7ZigP6w4J0
F	Ductile Failure Theories - Yield Criteria	https://youtu.be/YlRwO56r2UU https://youtu.be/5xnlK-P0mJw https://youtu.be/tb21eXIeIyU https://youtu.be/luYTn4rGx1g
M	Design Factor and Uncertainty vs. Factor of Safety	https://youtu.be/HZZWWpF45pw https://youtu.be/DuPtVa8mejc https://youtu.be/W8h2nm1tHCg
W	Tolerance Stack Ups and Tolerance Loops	https://youtu.be/_pHt_g0oLYs https://youtu.be/7ZKKEVQc7AA https://youtu.be/YfKVykP5p_M https://youtu.be/S4rwc44S4OU
F	Castigliano's Theorem	https://youtu.be/oJU94i-O19U https://youtu.be/-IAaMWJwuzE https://youtu.be/TV4-Adl-4Dk https://youtu.be/7tcNJTDhzkE
M	**EXAM 1** - Project Assignment Posted	
W	Fracture Toughness	https://youtu.be/3CPRRov7DRk https://youtu.be/qcpvGc_foJA https://youtu.be/80OdpCHQZ_Y
F	Crack Propagation	https://youtu.be/wLm_IjFcltA https://youtu.be/ocZge17En4Y
M	Fatigue SN Diagrams	https://youtu.be/bKisZhBzQsU https://youtu.be/ioUtq35bkXI https://youtu.be/FfaR8xx83Bs https://youtu.be/qZcri2IxdIw
W	Marin Factors and Corrected Endurance Limit	https://youtu.be/kZwl9Jysk64 https://youtu.be/4nN5zwS9xnQ https://youtu.be/Nvn78MOgoa8
F	Fatigue Stress Concentration and Notch Sensitivity Factors	https://youtu.be/nCEn924X2aI https://youtu.be/4FbiChMyu1Y https://youtu.be/DkgiIGcaH6o https://youtu.be/2AmoALt03m8
M	Fatigue Failure Criteria	https://youtu.be/mAJsN1_IY2U https://youtu.be/Wfj2mjraWts https://youtu.be/COv_Dh43nkQ https://youtu.be/p9jqQINQZKY
W	Shaft Design and Iterative Process	https://youtu.be/Fp5-jjmaksM https://youtu.be/UyO0-jfA3tY

		https://youtu.be/BH_T__y9WYY https://youtu.be/0Veu-aZ8lFk
F	Power Screws – Torque to Force Relationship	https://youtu.be/BstZUC4tcOA https://youtu.be/vrsZgENK9IM https://youtu.be/VnYXcT3LybM https://youtu.be/-g4niDjMU2M
M	Screw Thread Stress	https://youtu.be/46lcuQYQ14g https://youtu.be/hO1P7TSiNb8 https://youtu.be/y56am07osFY https://youtu.be/HIt8D4XVesw
W	Fastener and Member Stiffness	https://youtu.be/CDmvSRMwCyQ https://youtu.be/SD9QY8ZDSVs https://youtu.be/sRDB6Z4cSOg https://youtu.be/JTQzPdxkJVw
F	Bolt Tension	https://youtu.be/NsJ0uS7sZxo https://youtu.be/fXIgZ8RiHSI https://youtu.be/_j0n2GutMec https://youtu.be/Zuc6joLjwII
M	Proof Strength and Factors of Safety	https://youtu.be/j6B433Xdtb0 https://youtu.be/oPgAyPvQL98 https://youtu.be/CYrCN3s6DAA
W	Spring Stress and Spring Constant	https://youtu.be/5Vv1NBvpG4Y https://youtu.be/DFPd2zuZBfc https://youtu.be/u3hY7wnFl0c https://youtu.be/nGTtxfKrnX0
F	Shearing Yield Strength and Presetting	https://youtu.be/iGED8XYE3PI https://youtu.be/8Pg5QF1h_pc https://youtu.be/hd83FesDGmg
M	Springs Fatigue – Zimmerli Data	https://youtu.be/Y29Q-Q91xlk https://youtu.be/Ie34F8O6c2E https://youtu.be/UwVTcRxpA4Y
W	Spring Design Restrictions	https://youtu.be/dsWQrzfQt3s https://youtu.be/4rCCXK67x6E https://youtu.be/q9JLxlRQV74 https://youtu.be/OYKuFL2Ikok
F	Extension Springs	https://youtu.be/wKzU2s9bEA8 https://youtu.be/Gcezgpt1aqY
M	**EXAM 2**	
W	Recharge Day	
F	Gear Relations and Nomenclature	https://youtu.be/NF8fpuczU5I https://youtu.be/0P8ij3gUX3w https://youtu.be/vnvCm6Tz-uQ https://youtu.be/snm4OtMVAmc
M	Gear Trains and Planetary Gears – Mechanical Advantage	https://youtu.be/zE4HGKRufU0 https://youtu.be/yivxUMn6DVc https://youtu.be/OIY4qXsBS2E https://youtu.be/RIyA6pV859Q
W	Spur Gear Forces and Force Components	https://youtu.be/UieUEBnO5ps https://youtu.be/Uw5iM4sY2BY https://youtu.be/atYGI7tifU0
F	Helical and Bevel Gear Forces	https://youtu.be/921ToiOynMA https://youtu.be/bFxB1wgLfMM https://youtu.be/JIbI-kF5oj4
M	Worm Gear Forces	https://youtu.be/7cNR4YJ1cnI https://youtu.be/30H0xBhFpfY

W	Bending Stress at the Teeth – Lewis Form Factor	https://youtu.be/J1i29j43trM https://youtu.be/TQkkGa0HjzE https://youtu.be/aOcGOlr6pNc
F	Pitting - Surface Compressive Stress	https://youtu.be/g2q-S6SJ9n4 https://youtu.be/eESxXoQszrc https://youtu.be/se09vBWFgNw
M	Bearing Radial Loads	https://youtu.be/aU4CVZo3wgk https://youtu.be/HpixMte7mLg https://youtu.be/5odj0kIqx1s
W	Bearing Reliability	https://youtu.be/HxnOMUx7w3o https://youtu.be/bu5yKuFk5wY https://youtu.be/TWPJtvhbEEU
F	Bearing Axial Loads and Equivalent Combined Loads	https://youtu.be/3b8yOMSWXXk https://youtu.be/_aGfFsOvHvs https://youtu.be/IrZXOU5-HmU https://youtu.be/i4nqgeRTsY4
M	Gear, Bearings, Shaft, Power Screws, Spring Systems	
W	**EXAM 3**	

Other Course Information

Textbook
Title: SHIGLEY'S MECHANICAL ENGINEERING DESIGN
ISBN-13: 978-1260407648
ISBN-10: 1260407640Author: BUDYNAS
Edition: 11TH
Copyright: 2020
Publisher: MCGRAW-HILL

Grading Scale: The final grade will be calculated by the following table.

Table 1. Grading Table. *%GE = Percent Grade Earned.*

Percentage Range	Grade Point
$93.33 \leq$ %GE $< 100.00 \Longrightarrow$ A	4.00
$90.00 \leq$ %GE $< 93.33 \Longrightarrow$ A-	3.67
$86.67 \leq$ %GE $< 90.00 \Longrightarrow$ B+	3.33
$83.33 \leq$ %GE $< 86.67 \Longrightarrow$ B	3.00
$80.00 \leq$ %GE $< 83.33 \Longrightarrow$ B-	2.67
$76.67 \leq$ %GE $< 80.00 \Longrightarrow$ C+	2.33
$73.33 \leq$ %GE $< 76.67 \Longrightarrow$ C	2.00
$70.00 \leq$ %GE $< 73.33 \Longrightarrow$ C-	1.67
$66.67 \leq$ %GE $< 70.00 \Longrightarrow$ D+	1.33
$63.33 \leq$ %GE $< 66.67 \Longrightarrow$ D	1.00
$60.00 \leq$ %GE $< 63.33 \Longrightarrow$ D-	0.67
$00.00 \leq$ %GE $< 60.00 \Longrightarrow$ E	0.00

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	Low
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	Low
6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

Grade Corrections:
Corrections of grades should be submitted to instructor within 5 business days of the grade posting in writing with a concise statement of why you believe there has been an error. Note that the instructor has the final determination in the grade assigned. If a grade change is determined, it may result in a lower or higher grade.

Academic honesty
All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a student at the University of Florida and to be honest in all work submitted and exams taken in this class and all others.

Accommodation for Students with Disabilities
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) 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 Evaluation
Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. 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/.

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/.

Software Use
All faculty, staff and student 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 regarding grades earned in courses and on individual assignments. For more information, please see: http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

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