Engineering Mechanics: Statics

EGM 2511 Section Honors 19644, Section 26129
Class Periods: MWF 7th Period Honors (1:55 to 2:45p), MWF 8th Period (3:00 to 3:50p)
Location: FLG-265 (7th), MAEB-238 (8th)
Academic Term: Spring 2023

Instructor:
Name: Mike Griffis
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Office Location: MAEA-212
Office Hours: M/W: 4:00 to 5:00p in MAEB-237, F: 8:00 to 9:00a by Zoom (other times on arrangement).

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Please contact through the Canvas website

Course Description
Reduction of force systems, equilibrium of particles and rigid bodies, vector methods and their application to structures and mechanisms. (3 Credits)

Course Pre-Requisites / Co-Requisites
Prereq: PHY 2048; Coreq: MAC 2313

Course Objectives
At the end of the course, the student will be able to
- Understand and use the idealizations of particle, rigid body, concentrated force
- Understand Newton's three laws of motion
- Understand gravity and weight
- Understand and use the units of measurement for statics
- Understand and use significant figures
- Apply vector algebra to forces or positions
- Use triangle and parallelogram laws for forces or positions
- Use Cartesian coordinates for forces or positions
- Use dot and cross products for vectors
- Obtain moment vector of force
- Apply vector algebra to moments, use Cartesian coordinates for moments
- Determine force, position, or moment resultants
- Recognize couple moments that are free vectors
- Normalize force, position, or moment vectors, get magnitudes
- Analyze force/moment vector pairs for equivalency
- Determine linear dependence, independence for force, position, or moment vectors
- Declare interacting forces and moment subspaces acting between two touching rigid bodies (their joint)
- Understand static equilibrium
- Draw a free body diagram for a system of rigid bodies
- Draw a free body diagram for each rigid body of a system of rigid bodies
- Analyze a system of rigid bodies seeing some applied loads and determine interacting and reaction loads
- Analyze a system of rigid bodies seeing some applied loads and determine whether system is statically determinate (or indeterminate)
- Analyze 2D and 3D problems
- Analyze a truss by method of joints
- Analyze a truss by method of sections
- Consider a virtual cut of a rigid body that splits it into two parts and declare loads that interact at the cut
- Draw shear and moment diagrams

- Analyze using distributed loads and declare their resultants
- Determine center-of-mass and analyze using self-weight
- Analyze using fluid pressure
- Analyze using springs that are deflected from their unloaded positions
- Analyze using dry friction that sees motion or impending motion
- Analyze using dry friction in machines or bearings
- Determine 2nd moment of area of a cross-section
- Use parallel axis theorem for composite areas
- Understand work and use principle of virtual work
- Understand conservative forces, potential energy, and stability.

Materials and Supply Fees
N/A

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	
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
R. C. Hibbeler, Engineering Mechanics: Statics, 15th Edition, 2022, Pearson, ISBN: 9780134814971
Comments: The ISBN provided is for a rental edition (hardback I think). Avoid "International Editions" because they don't include US customary units. You can buy outright for two semesters of rental plus $5, I am told. I am using the 15th edition. Other editions may or may not be equivalent.

Recommended Materials
Supplemental materials for Honors section will be posted on Canvas site.

Required Computer:
This is discussed on both the department and college websites:
- https://www.eng.ufl.edu/students/resources/computer-requirements/
- https://mae.ufl.edu/academics/prospective/undergraduate/computer-requirements/

Bottomline: if you don't have a laptop, you need one. If you have one that works, feel free to discuss with the instructor whether it will suffice.

Course Schedule

Week		Lecture	Topic	Chapter
1	09-Jan (Mon)	1	Course Introduction	
	11-Jan (Wed)	2	Idealizations, units, laws, weight, significant figures	1
	13-Jan (Fri)	3	Scalars, vectors, triangles, resultants	2
2	16-Jan (Mon)		Martin Luther King Jr. day	
	18-Jan (Wed)	4	Cartesian coords, unit vector, magnitude, position vectors	2
	20-Jan (Fri)	5	Dot product, linear combinations, vector algebra	2
3	23-Jan (Mon)	6	Linear dependence, independence	2
	25-Jan (Wed)	7	Free Body Diagrams (2D) for particles	3
	27-Jan (Fri)	8	Free Body Diagrams (3D) for particles	3
4	30-Jan (Mon)	9	Moments of force, scalar, vector, cross product	4
	01-Feb (Wed)	10	Couples, simplified force/couple systems	4
	03-Feb (Fri)	11	Moment Resultants and the Wrench	4
5	06-Feb (Mon)	12	Exam 1 (8:20p to 10:10, Location TBD), prep during class	
	08-Feb (Wed)	13	Equilibrium of Rigid Bodies (2D) and FBD	5
	10-Feb (Fri)	14	Support reactions where rigid bodies touch	5
6	13-Feb (Mon)	15	Examples, Static Determinacy	5
	15-Feb (Wed)	16	Equilibrium of Rigid Bodies (3D) and FBD	5
	17-Feb (Fri)	17	Support reactions where rigid bodies touch	5
7	20-Feb (Mon)	18	Examples, Static Determinacy	5
	22-Feb (Wed)	19	Trusses, Method of Joints	6
	24-Feb (Fri)	20	Trusses, Method of Sections	6
8	27-Feb (Mon)	21	Spatial trusses	6
	01-Mar (Wed)	22	Frames and Machines	6
	03-Mar (Fri)	23	Examples	6
9	06-Mar (Mon)	24	Exam 2 (8:20p to 10:10, Location TBD), prep during class	
	08-Mar (Wed)	25	Internal Loading, Shear and Moment Diagrams	7
	10-Mar (Fri)	26	Internal Loading, Shear and Moment Diagrams	7
10	20-Mar (Mon)	27	Examples, Distributed Loads, Self weight, cables, chains	7
	22-Mar (Wed)	28	Examples (3D)	7
	24-Mar (Fri)	29	Friction in machines	8
11	27-Mar (Mon)	30	Friction in wedges/screws	8
	29-Mar (Wed)	31	Friction in bearings	8
	31-Mar (Fri)	32	Examples	8
12	03-Apr (Mon)	33	Exam 3 (8:20p to 10:10, Location TBD), prep during class	

	05-Apr (Wed)	34	Center of Gravity	9
	07-Apr (Fri)	35	Distributed Load Resultants, Fluid Pressure	9
13	10-Apr (Mon)	36	Examples	9
	12-Apr (Wed)	37	2nd moment of area	10
	14-Apr (Fri)	38	Parallel axis theorem, composite areas	10
14	17-Apr (Mon)	39	Work and Virtual Work	11
	19-Apr (Wed)	40	Rigid Body Systems	11
	21-Apr (Fri)	41	Conservative Forces, Potential Energy, Stability	11
15	24-Apr (Mon)	42	Examples	11
	26-Apr (Wed)	43	Course Review	
	28-Apr (Fri)		Reading Day	

Important Dates
Exam 1:   06-Feb (Mon) 8:20 to 10:10p, Location TBD
Exam 2:   06-Mar (Mon) 8:20 to 10:10p, Location TBD
Exam 3:   03-Apr (Mon) 8:20 to 10:10p, Location TBD
Final Exam: 29-Apr (Sat) 10:00a to 12:00p, Location TBD

Attendance Policy, Class Expectations, and Make-Up Policy
You are responsible for participating, staying up-to-date on all announcements, in-class lectures, posted video lectures, reading assignments, homework, and Webgems. Course notes will not always be supplied on the Canvas webpage. Late homework is not generally accepted. Late Webgems will not generally be accepted. Late project submission is not generally accepted. Makeups and makeup exams are only allowed for students with extreme, documented circumstances. Students must contact the instructor as soon as possible to provide documentation and request a make-up exam. Final exam is required and there is no make-up final.   Note: club sport activities are not excused absences, personal vacations are not excused absences, job interviews are not excused absences.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies in the undergraduate catalog. Excused absences require appropriate documentation. See https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx .

Evaluation of Grades
Assignment	Total Points	Percentage of Final Grade
Homework/Webgems (~35)	~100 each	20%
Midterm Exam 1	100	20%
Midterm Exam 2	100	20%
Midterm Exam 3	100	20%
Final Exam	100	20%
		100%

Grading Policy
Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67

66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	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

Homework/Webgems
The intent is to have a Webgem for you everyday that ensures you have grasped the message of the day. A Webgem is an interactive program (written by me) that runs on my UF-based Linux server. To access the provided link, you need to DUO into the system. Webgem scores do not immediately show up in Canvas.

Some Webgems will also have a Homework upload to Canvas. The assignment will be clear in that regard.

Honors Section
In the Honors section, more involved problems will be explored during class, in Webgems, and in exams. Additional linear algebra will be taught. Screw theory will be introduced. Programming in Python will be introduced and some use required.

Honorlock:
Consistent with University of Florida policy, Honorlock *may* be used for the mid-term exams and the final. Please see the following link: https://distance.ufl.edu/proctoring/ for more information.

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/. 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/. 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/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

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/process/student-conduct-code/) 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
• Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@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

Campus Resources:

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: https://counseling.ufl.edu, 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**, 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/.

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.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.ufl.edu.

Library Support, http://cms.uflib.ufl.edu/ask. 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/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints*: https://distance.ufl.edu/state-authorization-status/#student-complaint.