

BME 4931 Fundamental Biomechanics

Spring 2021

Catalog Description:

This course covers fundamental mechanical principles as they related to biological systems. Topics covered in this course include summation of forces and moments in static systems, the equations of motions, and conservation of energy during mechanical loading. All topics are discussed in the unique context of biological systems.

Credits: 03

Prerequisites and Expectations:

Students should have completed Physics 1 & 2 (PHY2048, PHY2049), along with Calculus 1, 2, & 3 (MAC2311, MAC 2312, MAC2313). Vector calculus is particularly essential for this course (MAC2313)

Students are expected to have a computer capable of running remote learning software (camera, microphone, and internet access).

Course Information:

Instructor: Kyle D. Allen, Ph.D.

Office: Zoom/virtual

Office Hours: After each class till 3:00, One on one by appointment

Email: kyle.allen@bme.ufl.edu (Please include BME4931 in the subject line in order to avoid my email filters. Failure to do this may delay my response by several days!)

Class Meeting:

This course will be taught in a flipped classroom environment. The philosophy is ‘see do, do it, test it’. Pre-recorded lectures are the “see it” part; in class is the “do it” part; homeworks are the ‘test’.

Pre-recorded lectures will be available in advance of the module to which they correspond. These are required. Students should view these and engage with the material in advance of the corresponding live meetings.

In-class time will be dedicated to solving problems related to the lectures as a group. Most in-class sessions will not take the full class period; thus, students are encouraged to start homework problems related to the lectures and use this extra time as office hours.

Be sure to sign on prior to the lecture start time.

- Monday, Wednesday, Friday Period 7 (1:55 PM – 2:45 PM)

Join Zoom Meeting

<https://ufl.zoom.us/j/94227192832?pwd=NU1PT29lUVZlOW9lTnRQMzhSZmZndz09>

- Meeting ID: 942 2719 2832, Passcode: BME4931

Resources and Recommended Texts (not required):

- This course is a developmental course, and is currently based on the following:
 - Section 1: Vector Mechanics for Engineers (by Beer and Johnston)
 - Section 2: Fundamental of Biomechanics (by Knudson)
 - Section 3: Mechanics of Biomaterials (by Pruitt)
- In the future, I plan to have a text, and right now I am leaning toward:
 - Biomechanics: Concepts and Computation (Oomens et al.)

Important Teaching Note:

This is a sophomore level course being taught remotely during the worst pandemic in 100 years. Moreover, it's a developmental course, which means, I have never taught this course before (nor has anyone in our department!) The goal for this class (potentially) is to replace the statics requirement in our curriculum. There are reasons for this development which will be discussed the first day; however, a decision has not been made.

In normal times, students are expected to be highly motivated, proactive, and engaged participants in their continued education. Given the present circumstances, it is even more important that students take a leading role and make a major effort to further their education. Please engage in the forums, in class, office hours, and other avenues that I provide to communicate, teach, and mentor. This class will not be perfect, though I will strive to do my best each and every class. Your feedback and your patience will be highly valued and will help me to make this class the best that it can be for the future of our program.

In addition, it is impossible to cover all of mechanics topics for BME in a single semester. This is part of the challenge with statics for BME (which is very important! But, does not cover moving systems!). My goal is to ensure all students are prepared with fundamentals in mechanical systems, preparing students to extend into new domains of biomechanics in their elective classes.

Format and Grade Determination:

Grade Breakdown

75% Exams

15% Homework

10% Class Participation / In-class activities

Final grades will be calculated two ways, with students receiving the higher of the two marks.

Method 1 (equal distribution): Each exam will be 25% of your grade, each homework will be 5%.

Method 2 (student improves throughout): Exam 1 will be 20%, Exam 2 will be 25% and Exam 3 will be 30%; Homework 1 will be 3%, Homework 2 will be 5%, and Homework 3 will be 7%.

This method provides students the opportunity to demonstrate improvement throughout the course. Not all students will adjust and learn this material at the same rate. This scoring system allows later bloomers the opportunity to show improvement and get some credit for that growth.

Exams will have 3 components.

- (25%) Component 1 is a timed quiz focused on key course principles. It will be taken on CANVAS within a prescribed time, typically the night before Component 2. Students will get 1 attempt.
- (50%) Component 2 is in-class problem solving. Students will complete problems related to the course content during the class period. Students must have their cameras and microphones on during this part; please find a quiet and appropriate place for this event. Students will turn in their work at the completion of the course period – scanned work pages.
- (25%) Component 3 is a take-home problem. Students will have 48 hrs to complete this problem. It is not timed, though students may not discuss the problem in any form with their classmates.

A homework sheet will be provided for each lecture, roughly 10-12 problems per section. Time in class should be available for students to start (but not complete) the problem. This should help students set-up the problem.

Participation is not attendance. It will consist of a summary of participation points; these may be as simple as participating in and submitting in-class problem-based learning sessions. Other participation activities may include a quiz or other activity during the scheduled course time. Attendance will not be taken, but if you fail to show up to class, you will miss opportunities to get participation credits.

Grading Scale

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
90.0-100	87.0-89.9	84.0-86.9	81.0-83.9	78.0-80.9	75.0-77.9	72.0-74.9	69.0-71.9	66.0-68.9	63.0-65.9	60.0-62.9	0-59.9

I will round your grade to the nearest tenth of a point; then, your letter grade will be assigned based on the above table. I very rarely curve grades. Typically, if the majority of the class is unable to answer a question, we will review the question and then decide whether it was unnecessarily difficult or confusing. If the question is removed, it will affect everyone's grade, not a select few.

Course Policies:

Policy on Working Together and Group Work:

As peer-to-peer learning enhances learning, students are highly encouraged to ask general questions in class. However, work that is handed in for grading must be the individual's work. Direct copying is against the honor code of this institution and is not allowed. If identified, all students involved—those that copied and those that allowed the copying to take place—will receive a grade of zero and will be reported to the university for review.

Examples of how this policy applies to homework –

You can –

Discuss how the problem should be set up

What equations and methods apply to the problem

Discuss how you interpret the question and come to consensus on how the question should be interpreted.

You cannot –

Share answers or calculations.

Examples of how this policy applied to exams –

You can –

Do your best work on your own.

You cannot –

Discuss any part of the problem with your classmates, including set up, equations, or interpretation of the question. All questions of interpretation should be directed to Dr. Allen.

Policy on Attendance

I expect students to attend the class regularly. However, attendance in class is not strictly required for full credit in the participation section of the course; you may miss a few days and still receive full credit. Absences do need to be excused, but please ask. I understand that, in this environment, you may have additional constraints to manage. I will work with you to the best of my ability, but I also need to respect the training that I've been tasked to provide to the students in our department and college. As such, I expect students to be in class, ready to learn, engaged, and overall contributors to the learning environment. This is clearly not possible if you cannot regularly attend class.

Policy on the Course Evaluation

Part of our job as instructors is to constructively evaluate you as a student. Part of your job as a student is to constructively evaluate us as instructors. The only metric we can see before grades are due is percentage of the students that evaluated the course—we cannot see scores, comments, or any other content until grades are submitted. Thus, you should write your honest, constructive opinion of the course. We do value this feedback and this feedback is used by our department, college, and university.

Policy on Late Coursework

Unless *prior arrangements* have been made with an instructor, students will be deducted 15% (defined as 1.5 letter grades) per day (24h) for late coursework, with deductions occurring at the time associated with the due date. E.g., 24.001 hours after the due date and time results in a 30% (3 letter grade) reduction.

If you are sick, please contact the instructor as soon as is reasonable. With proper documents from health professionals, I can reverse this policy at my discretion. Take care of your health, but also respect the rapid turnaround of grading before the exam.

Policy on Grade Corrections

Students have 1 week after receiving a grade to challenge errors or grading mistakes. 1 week after students have been informed of their grade, the grade will become final and will not be changed. Do not wait for the end of the semester; I will not adjust your grade for assignments that are beyond this deadline (unless an extension has been previously granted)!

To challenge a grade: Students must attach a cover page to the front of the assignment, explaining what they want to be re-graded. We do occasionally make mistakes, but I will not participate in verbal debates over a grade. I will discuss the problem, my solutions, and the key; but, I will not participate in debates over a grade or the fairness of the situation. I will take in information; then, I will regrade when I have adequate time, space, and focus to assess the issue, taking the emotion of the situation out of the re-grade. I also reserve the right to re-grade the entire assignment, if needed, though this only occurs in rare instances. Again, mistakes do occur, we all make them, and they may be either a benefit or be detriment to your grade. **This policy is strictly enforced—no exceptions.**

COVID-19 Policies

We should not need face-to-face instructional sessions to accomplish the student learning objectives of this course. If that situation changes, the following university policies will be strictly enforced.

In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- If in-person instruction is required, a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) will be identified. You must utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies will be available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms ([Click here for guidance from the CDC on symptoms of coronavirus](#)), please use the UF Health screening system and follow the instructions on whether you are able to attend class. [Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.](#)

Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. [Find more information in the university attendance policies.](#)

For online course with recorded materials a statement informing students of privacy related issues such as:

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

^ I'm required to have this in the syllabus. I will NOT be recording any in person courses and these features will be disabled in zoom. I expect that everyone will have a microphone available to communicate with the class. Video is highly encouraged, but not required.

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/>.

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/>) 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>

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: <http://www.counseling.ufl.edu/cwc>, 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](mailto:title-ix@ufl.edu), 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 Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.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://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.