BME 2202 Engineering Statics and Dynamics in Biological Systems

BME 2202

Class Periods: Tues Periods 5-6 (11:45 AM - 1:40 PM), Thurs Period 6 (12:50 PM – 1:40 PM)

Location: HPNP G-111

Academic Term: Spring 2026

Instructor:
Daniel P. Ferris, Ph.D.
dferris@bme.ufl.edu
(352) 294-1281
Office Hours: TBD

Course Description

Principles of engineering statics and dynamics as they relate to biological systems. Topics include vector mathematics, summation of forces and moments in static equilibrium, equations of motion, dynamics of particles and rigid bodies, concepts of work, energy, and momentum, & introduction to deformable bodies. All topics are discussed in the context of biological systems.

Course Pre-Requisites

PHY2049, MAC2313.

Course Objectives

At completion of this course, students will be able to:

1. To apply vector mathematics to analysis of biological systems.
2. To calculate forces and moments at equilibrium within biological systems.
3. To calculate a summation of forces and moments of biological systems at non-equilibrium.
4. To calculate changes in energy and momentum of biological systems approximated as rigid body systems.
5. To calculate dynamics of deformable bodies, including stress and strain.
5. To identify the basic mechanical properties of biological tissues.

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	
3. An ability to communicate effectively with a range of audiences	
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	Medium

*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

Title: Fundamentals of Biomechanics: Equilibrium, Motion, and Deformation
Authors: Nihat Özkaya, Dawn Leger, David Goldsheyder, Margareta Nordin
Publication Date: 2017 (4th edition)
Hardcover, softcover, or eBook are all okay to use:
Hardcover ISBN: 978-3-319-44737-7
Softcover ISBN: 978-3-319-83125-1
eBook ISBN: 978-3-319-44738-4

Course Schedule

Week 1:	Introduction to Biomechanics
Week 2:	Force Vectors
Week 3:	Moment and Torque Vectors
Week 4:	Systems in Equilibrium
Week 5:	Applications of Statics in Biological Systems
Week 6:	Introduction to Dynamics
Week 7:	Linear Kinematics
Week 8:	Linear Kinetics
Week 9:	Angular Kinematics
Week 10:	Angular Kinetics
Week 11:	Impulse and Momentum
Week 12:	Deformable Bodies
Week 13:	Stress and Strain
Week 14:	Dynamics at Different Size Scales in Biological Systems
Week 15:	Review
FINAL EXAM	Monday, April 27, 10 am – 12 noon

Attendance Policy, Class Expectations, and Make-Up Policy

Regular lectures will be held in person in the designated classroom. Attendance at lectures is REQUIRED as the only way to learn the material will be practicing problems. We will work on problem solving in class with help from peers and the instructor. This cannot be replaced with at home study. For every class you miss without pre-approved permission, 1% will be taken off your final grade.

Weekly quizzes will be completed outside of class through the Canvas course website. They will have a two-hour time limit. The midterm and final exam will be completed in class and will require students to be present during the exam. There will be homework assignments for student practice but they will not be graded. Answers will be provided for homework assignments to help students work through the problems.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:
https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Evaluation of Grades

Assignment	Percentage of Final Grade
Quizzes	30%
Midterm Exam	30%
Final Exam	40%

Grading Policy

The grading scale for the course will be as follows:

Grade	Percentage
A	92.50-100%
A-	90.00-92.49%
B+	87.50-89.99%
B	82.50-87.49%
B-	80.00-82.49%
C+	77.50-79.99%
C	72.50-77.49%
C-	70.00-72.49%
D+	67.50-69.99%
D	62.50-67.49%
D-	60.00-62.49%
F	below 60.00%

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

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

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu