

## Biomechanics Fall 2021

<b>Instructor:</b>	Dr. Amir K. Miri
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<b>Office Hours:</b>	Friday 13:00 pm-15:00 pm online ( <a href="https://njit.webex.com/meet/am3296">https://njit.webex.com/meet/am3296</a> ) or by appointment
<b>Grader:</b>	Mr. Mert Kanik, <a href="mailto:mk278@njit.edu">mk278@njit.edu</a> (email him regarding your grade concerns)
<b>Time/Locations:</b>	Tuesday & Thursday: 8:30 am - 9:50 am/Kupfrian Hall 206 <a href="https://njit.webex.com/meet/am3296">https://njit.webex.com/meet/am3296</a> (in case of online)
<b>Textbook:</b> (Required)	<i>Basic Biomechanics of the Musculoskeletal System</i> , 5th Edition (or 4th Edition) Nordin, Margareta, Wolters Kluwer Health, 2020. ISBN: 9781975141981
(Recommended)	<i>Human Body Dynamics: Classical Mechanics and Human Movement</i> , 2000 edition Tozeren, Aydin. Springer-Verlag, 2000.
<b>Prerequisite:</b>	BME 302, MECH 236 and MECH 320. Tensor analysis; Kinematics of continuous media; Stress; The elastic solid; Newtonian fluid; Conservation principles of mass, momentum and energy; Viscometric flows; Formulation of constitutive equations; Applications to the modeling of bone and other living tissues (Statics and Mechanics of Materials, 4th /5th edition, by R.C. Hibbeler).

### Course Description:

This course is designed to provide the student with a clear and thorough demonstration of the theory and applications of engineering mechanics to human body. Biomechanics is studied in a diverse set of disciplines including biology, engineering, physiology, medicine, and human movement science. The study of biomechanics has seen a growing interest as people wish to avoid injury, design ergonomic workspace, design prosthetics and improve human performance. This course will provide you with the principles for analyzing human movement and the basic understanding to work with those in other fields to solve problems in biomechanics.

### Course Objectives:

Students will demonstrate a knowledge of the following:

1. Some concepts of mechanics such as stress analysis.
2. Structures and functions of the musculoskeletal system.
3. Structure-function relationship in bones.
4. Biomechanics of articular cartilage.
5. Biomechanics of skeletal muscle and tendons.

### Software:

Microsoft PowerPoint

### Relationship of Course to Student Outcomes:

This course requires the student to demonstrate the following:

- 1) Identify differences between statics and dynamics conditions in human body
- 2) Identify the types of forces in human organs and tissues
- 3) Understand the relation between organ physiology and function
- 4) Understand the role of any mechanical load that can create disease/pathology!

**Grading:**

Homework	20%
Exam/Quiz I	10%
Exam/Quiz II	10%
Exam/Quiz III	10%
Project	15%
Final Exam	25%
Class Activity	10%
Total	100%

A	90-100%	B+	86-90%	B	80-86%
C+	76-80%	C	70-76%	D	60-70%
F	0-60%				

**Academic Integrity Policy / Classroom Behavior Policy:**

For Academic Integrity Policy and Classroom Behavior Policy, please refer to the Student Information Guide and Student Handbook.

**Disability Accommodation:**

Your academic success is important. If you have a documented disability that may have an impact upon your work in this class, please contact me. Students must provide documentation of their disability to the Academic Success Center in order to receive official University services and accommodations. The Academic Success Center can be reached at Student Center. The staff is available to answer questions regarding accommodations or assist you in your pursuit of accommodations. We look forward to working with you to meet your learning goals.

**Course Schedule:**

Week	Topics	Reading	Exams
1 (08/30)	Review of Mechanics – Stress/Strain	Ch. 0	
2 (09/06)	Review of Mechanics – Introduction to Biomechanics	Ch. 1	
3 (09/13)	Bone	Ch. 2	
4 (09/20)	Bone	Ch. 2	
5 (09/27)	Articular Cartilage	Ch. 3	Exam/Quiz 1
6 (10/04)	Articular Cartilage	Ch. 3	
7 (10/11)	Tendons and Ligaments	Ch. 4	
8 (10/18)	Tendons and Ligaments	Ch. 4	Exam/Quiz 2
9 (10/25)	Skeletal Muscles	Ch. 6	
10 (11/01)	Knee joint	Ch. 7	
11 (11/08)	Summary/Presentation		Exam/Quiz 3
12 (11/15)	Seminar (Externals): Dr. Trkov, Dr. Abedin, Dr. Petrin		
13 (11/22)	Project Presentations (Student Groups)		
14 (11/29)	Project Presentations (Student Groups)		

**This schedule is preliminary and subject to change!**

**Policies**

It is required to use Canvas in your school portal for this course. The Course ID is BME 451. Please use Piazza for communication and discussing regarding this course.

Attendance is mandatory for all sessions. The attendance will be recorded via a Google questionnaire collected at the end of each session (this is a part of a funded NSF project). A link will be sent via email/Canvas and you will have two-to-three minutes to answer four multi-option questions and one descriptive question.

Pre-Lecture PowerPoints or Texts (PDF) will be uploaded into Canvas during the weekend time. Covering the uploaded documents and practicing pre-class problems (if suggested by instructor) will be Mandatory for this course. The instructor will ask students (based on a random selection) on pre-reading materials.

All assignments are due on the specified due date (Canvas). No late returns will be accepted. Three exams/ quizzes will be given throughout the semester (the schedule is tentative). No make-up exams or assignments will be given unless a medical or other verified emergency is the reason for missing the exam or the assignment.

In order to effectively accomplish the goals and objectives for this course, students are expected to attend online/physical sessions and be on time. If you are absent for any reason, it is your responsibility to find out what you missed by contacting your classmates. Excessive absence or tardiness results in a lower final grade for the course.

For Academic Integrity Policy and Classroom Behavior Policy, please refer to the following link:

<https://www.njit.edu/dos/academic-integrity>