

# Biomechanical Basis of Movement

APK3220C | Class # 10445,17724 | 3 Credits | Spring 2025

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## Course Info

### INSTRUCTOR

**Matt Terza Ph.D. CSCS**

Office: FLG 135

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Preferred Method of Contact: email directly at [mjt023@ufl.edu](mailto:mjt023@ufl.edu)

### OFFICE HOURS

M | 12:45 – 1:45 PM

W | 10:40 – 11:40 AM

Or by appointment

### MEETING TIME/LOCATION

#### **Class Number: 10445**

M,W,F | Period 2 (8:30 AM - 9:20 AM) FLG265

Primarily Classroom/Traditional

Final Exam: 5/1/2025 @ 3:00 PM - 5:00 PM

#### **Class Number: 17724**

M,W,F | Period 5 (11:45 AM – 12:35 PM) FLG265

Primarily Classroom/Traditional

Final Exam: 4/29/2025 @ 3:00 PM - 5:00 PM

## COURSE DESCRIPTION

Fundamentals of kinematics and kinetics related to human movement. Basics of biomechanics applied to the concepts of injury prevention and performance improvement. Overview of various biomechanical data collection and analysis.

## PREREQUISITE KNOWLEDGE AND SKILLS

Junior or senior standing; (APK 2100C or BSCX094+L or BSCX086+L or PETX322+L or ZOO3733c) and MAC 1140 with minimum grades of C); or PHY 2048 or PHY 2053 with minimum grade of C

*\* Having already taken Physics 1 and Anatomy will be **very helpful** in this course. You can be successful in this course if you have not taken physics and anatomy, but it will require significantly more effort to get comfortable with the physics concepts intrinsic to biomechanics and learn the structure and function of the musculoskeletal system.*

## REQUIRED AND RECOMMENDED MATERIALS

### Required Textbook:

*Basic Biomechanics* by Susan Hall 9<sup>th</sup> Edition

### Required Software:

- Microsoft Word and Excel 2010 or later
- Muscle and Motion (online application – Login for you is provided)
- TopHat - \$33 for semester subscription

## COURSE FORMAT

This course meets live for 3 periods per week. 2-3 sessions per week will be lecture based presentation of material which will comprise most of the testable content for exams. 0-1 session per week will include in class lab activities/assignments and discussions.

There will be some mandatory videos (i.e., containing testable content not covered directly in class) which will be noted overtly on Canvas).

## COURSE LEARNING OBJECTIVES:

1. Identify biomechanical principles/concepts and describe the impact of biomechanics research on daily life
2. Describe and evaluate the situational applicability of the basic technology behind biomechanical instrumentation with a focus on motion capture
3. Apply qualitative and quantitative techniques to specific movements patterns to measure, describe, and analyze human movement
4. Solve biomechanical problems related to exercise, sport, and health using calculations related to:
  - a. Linear and angular kinematic variables (including position, velocity, acceleration)
  - b. Linear and angular kinetic variables (including force, torque, momentum, impulse, work, power, and energy)
  - c. Estimating the center of mass position
5. Explain the basic mechanical properties, interactions, and functions of bones, tendons, ligaments, muscle, joints, and cartilage

## Course & University Policies

### ATTENDANCE

Attendance is expected and participation via TopHat will be reflected in your course grade. Excused absences will be considered in accordance with the University of Florida's policies and guidelines.

### PERSONAL CONDUCT & ACADEMIC INTEGRITY

Students are expected to exhibit behaviors that reflect highly upon themselves and our University.

University of Florida students are bound by the Honor Pledge. On all work submitted for credit by a student, the following pledge is required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The [Student Honor Code and Conduct Code \(Regulation 4.040\)](#) specifies a number of behaviors that are in violation of this code, as well as the process for reported allegations and sanctions that may be implemented. All potential violations of the code will be reported to Student Conduct and Conflict Resolution. If a student is found responsible for an Honor Code violation in this course, the instructor will enter a Grade Adjustment sanction which may be up to or including failure of the course.

## APPROPRIATE USE OF AI TECHNOLOGY

The UF Honor Code strictly prohibits *cheating*. The use of any materials or resources prepared by another person or Entity (inclusive of generative AI tools) without the other person or Entity's express consent or without proper attribution to the other person or Entity is considered *cheating*. Additionally, the use of any materials or resources, through any medium, which the Faculty / Instructor has not given express permission to use and that may confer an academic benefit to a student, constitutes *cheating*.

## 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 guest 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.

## EXAM MAKE-UP POLICY

Make-up assignments will be given at the discretion of the instructor. Late submissions are not accepted, as it is important to maintain fairness and consistency throughout the class. Please review "Grading" below for late submission or missed assessment policies (outside of documented and excusable scenarios).

Unexcused (including "inappropriate excuses") material cannot be made up and will result in a zero on that item. Please do **not** ask for an accommodation for inappropriate excuses, which include:

- Extracurricular activities
- Out of town/vacation
- Sleeping in
- Sports
- Technological issue due to procrastinated assignment upload
- Volunteering
- Work

A student experiencing an illness should visit the UF Student Health Care Center or their preferred healthcare provider to seek medical advice and obtain documentation. If you have an illness, family emergency or death, please contact the Dean of Students Office ([www.dso.ufl.edu](http://www.dso.ufl.edu)) and follow the DSO Care Team procedures for documentation and submission of a request for make-up assignment (<https://care.dso.ufl.edu/instructor-notifications/>). The DSO will contact the instructor. Do not provide any documentation to the instructor regarding illness or family emergency. This is your personal and protected information. The DSO is qualified to receive and verify the documents you provide. The instructor will follow the recommendations from the DSO.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

## ACCOMMODATING STUDENTS WITH DISABILITIES

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting their Get Started page at <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. **Any variation of this statement is acceptable. More details are always helpful for our DRC-registered students.**

## COURSE EVALUATIONS

“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://my-ufl.bluera.com/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.”

## Getting Help

### HEALTH & WELLNESS

- ***U Matter, We Care:*** If you or someone you know is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu), 352-392-1575, or visit [U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.
- ***Counseling and Wellness Center:*** Visit the [Counseling and Wellness Center website](#) or call 352-392-1575 for information on crisis services as well as non-crisis services.
- ***Student Health Care Center:*** Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the [Student Health Care Center website](#).
- ***University Police Department:*** Visit [UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).
- ***UF Health Shands Emergency Room / Trauma Center:*** For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; or visit the [UF Health Emergency Room and Trauma Center website](#).
- ***GatorWell Health Promotion Services:*** For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the [GatorWell website](#) or call 352-273-4450.

### ACADEMIC RESOURCES

- ***E-learning technical support:*** Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu).

- [Career Connections Center](#): Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
- [Library Support](#): Various ways to receive assistance with respect to using the libraries or finding resources.
- [Teaching Center](#): Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.
- [Writing Studio](#): 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.
- [Student Complaints & Grievances](#): Students are encouraged to communicate first with the involved person(s), but [here](#) is more information on the appropriate reporting process.

## Grading

Once a grade is posted students have **two weeks** to dispute an error in grading.

Category	Points	Percent
Exams (3)	320	42.11%
Quizzes (10)	230	30.26%
Homeworks (6)	130	17.11%
TopHat and Attendance	80	10.53%
Extra Credit	20	2.63%
<b>Total</b>	<b>760</b>	<b>100.00%</b>

**Lecture Exams (3)** (Please carefully review the course schedule and note when your section is scheduled to take exams)

There will be 3 lecture exams which consist of multiple-choice, true-false, short answer and free response problem solving questions. Students are not permitted access to any kind of materials or notes during these exams; however, a formula sheet will be provided. Exam questions are generated by the course instructor and the majority of focus should be given to the lecture notes, labs, muscle and motion videos, and problem sets when studying although supplementary readings/resources will also be helpful. Students will take exams in the same room where weekly meetings are held and will be allowed 50 minutes to complete the exam first 2 exams and 2 hours to complete the third exam. The third exam is not intended to be explicitly comprehensive exam only insomuch as concepts and quantitative skills build throughout the semester. A **SCIENTIFIC** calculator will be permitted during exams. The first 2 exams will be worth 100 pts and the 3<sup>rd</sup> exam will be worth 120 pts as it is a longer exam covering more material.

### Homework

These homework assignments will be assessed via a Canvas Quiz submission but will be multiple attempts permitted to give you the opportunity to work through the problems to hone your quantitative skills. These homework assignments will contain problems regarding the current week's topics in the content lectures and may also include movement analysis using Excel.

### Quizzes

Quizzes will be based on lecture content, Muscle and Motion videos listed for the module, and lab experiences. These are individual (i.e., not group) quizzes. Although typically you will not have questions beforehand, the

quizzes are open notes/book/videos and will have a relatively relaxed time constraint. These quizzes are to be taken as an INDIVIDUAL and **1 attempt** will be permitted.

### **Labs**

Lab are more interactive classroom experiences that provide an opportunity for students to embody concepts, practice collecting and analyzing data, and build classroom community. The points for the labs are based on attendance and taking quizzes with associated questions described in the previous section.

### **Attendance, Participation, and TopHat**

Top Hat questions will be mainly administered during class time, and you must be in attendance of class to answer these questions. Questions are mainly intended to be participation based, but review questions or questions based on an assigned videos may include an accuracy component in grading. TopHat may also be used to facilitate class discussions/assignments and to take attendance which is part of the same grading category.

Check the TopHat.com gradebook regularly to ensure your responses are being recorded. Technical issues with TopHat should be noted and resolved as they arise. If you have an issue during class with submission you need to talk to me at the end of class and ALSO send me an email to correct the error. Persistent issues should be addressed with TopHat support <https://success.tophat.com/s/contact-main>. I will not make grade changes to TopHat for request made more than two weeks after a missed day/question.

Attendance will be taken by a sign-in sheet on lab days where attendance recording is noted.

### **Extra Credit**

Students can earn up to 20 points of extra credit in this course. Extra credit opportunities will be offered and detailed in class but will involve demonstrating a deeper investigation and/or embodiment of a biomechanical topic(s) related to human movement. See Canvas page for more information.

### **GRADING SCALE**

More detailed information regarding current UF grading policies can be found here: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

Letter Grade	Percent of Total Points Associated with Each Letter Grade	GPA Impact of Each Letter Grade
A	90.00-100%	4.0
A-		3.67
B+	87.00-89.99%	3.33
B	83.00-86.99%	3.0
B-	80.00- 82.99%	2.67
C+	77.00-79.99%	2.33
C	73.00-76.99%	2.0
C-	70.00-72.99%	1.67
D+	67.00-69.99%	1.33

D	60.00-66.99%	1.0
D-		0.67
E	0-59.99%	0

## Weekly Course Schedule

### CRITICAL DATES & UF OBSERVED HOLIDAYS

- Jan 20 – MLK Day
- March 17-21 Spring Break
- April 24 & 25 Reading Days

This syllabus and schedule are intended to give the student guidance in what may be covered during the semester and will be followed as closely as possible. However, the professor reserves the right to modify, supplement and make changes as the course needs arise. This includes exam dates and lecture topics that may change depending on class progress.

### EXAM SCHEDULE

Please note the exam schedule based on your section. Exams 1 & 2 are 50-minute exams administered during normal class time. The final exam (exam 3) is a 2-hour exam scheduled by the UF registrar. This schedule shows the module corresponding most (some overlap more than one week) and the right column shows the specific daily lecture or activity.

Week	Dates (Week of Monday...)	Module	Daily Schedule
1	13-Jan	Introduction to Biomechanics	Introduction to Biomechanics
			Approach to analyzing movement with a view to gait.
			Vector Operations - Expression and Composition
2	20-Jan	Monday Holiday - No Class	No Class
		Fundamental Tools and Concepts	Vector Operations - Cross Product
			Degrees of Freedom
3	27-Jan	Fundamental Tools and Concepts	Mechanical Representation of Joints
			Muscle Biomechanics 1 - Muscle Anatomy and Physiology
			Muscle Biomechanics 2 - Factors Related to Muscle Force
4	3-Feb	Muscle Biomechanics	Muscle Biomechanics 3 - Mechanical Arrangements
			Muscle Biomechanics 4 - Torque and Components of Force
			Upper Body Anatomy
5	10-Feb	Upper Body Anatomy and Mechanics	Handstand Mechanics
		Exam 1 (Friday)	Handstand Lab (Attendance Taken) Exam 1 (Friday)
6	17-Feb	Kinematics 1	Biomechanical Instrumentation

			Position Velocity Acceleration Vector Operations - 2D Joint Angles
7	24-Feb	Lower Body Anatomy and Mechanics	Gait Lab (Attendance Taken)
			Squatting Biomechanics
			Hip
8	3-Mar	Lower Body Anatomy and Mechanics	Hip
			Knee
			Knee
9	10-Mar	Lower Body Anatomy and Mechanics	Ankle
			Ankle
		Exam 2 (Friday)	
10	17-Mar	Spring Break	Spring Break - No Class
			Spring Break - No Class
			Spring Break - No Class
11	24-Mar	Monday - No live class Kinematics 2	Equations of Constant Acc. (Online Lecture - No Live Class)
			Angular to Linear Translations
			General Motion
12	31-Mar	Kinematics 2	Hammer Throw Lab (Attendance taken)
			Extra Examples and Lab Reflection
			Linear Kinetics - Impulse and Momentum
13	7-Apr	Kinetics 1	Linear Kinetics - Impulse and Momentum
			Linear Kinetics - Energy Work and Power
			Linear Kinetics - Energy Work and Power
14	14-Apr	Kinetics 2	Linear Kinetics - Jump Lab
			Linear Kinetics - Equilibrium and Inverse Dynamics
			Linear Kinetics - Equilibrium and Inverse Dynamics
15	21-Apr	Kinetics 2	Linear Kinetics - Equilibrium and Inverse Dynamics
			Acroyoga Lab (Attendance taken)
		No Class - Thurs and Friday - Reading Days	
16	28-Apr Finals Week	Finals Week	Exam 3 (During University Assigned Timeslot)



## SUCCESS AND STUDY TIPS

- Do the Homework and hone a solution process for types of problem
- Explaining the material (out loud!) in your own words, from memory (no notes!)
- Come to office hours when you have questions/challenges
- Generate study questions to test yourself on conceptual information without the information in front of you
- Review old quizzes and homework to understand what and why mistakes were made
- (Re)watch recorded lectures as needed
- Relate course material to your real-life or your own personal examples/experiences