

**University of Florida**  
**Department of Applied Physiology and Kinesiology**  
**APK 3220C Biomechanical Basis of Movement**  
**Fall 2017**  
**Section 2798 Lecture: MWF 10:40 - 11:30AM, FLG 220**

Instructor: Dr. Blain Harrison  
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 Office hours: MWF 9:30AM - 10:30AM, 1:30-2:30PM, or by appointment

**Course Syllabus**

**Course Description**

Human movement does not occur spontaneously. Specific external factors interact with our body's anatomy, and we must formulate ways in which to move our anatomy in specific magnitude and scale to counter the external challenge. This course will focus on the anatomical, biomechanical, and sensorimotor principles that govern the way in which we move our bodies.

This course is designed to introduce students to the fundamentals of engineering (kinematics and kinetics) related to motor skills and human performance. Basic college mathematics and physics knowledge will be applied to problem solving in a classroom setting. While primarily a lecture course, experimental procedures and sport research techniques will be presented to facilitate lecture material.

Throughout this course, the aim will be towards functional application of the material presented, so that you will be able to apply the theory into practice, and finish the class with a new skill-set. The greatest test you'll face is not that of this course, but of your future athletes, clients, and/or patients who will come to you seeking advice and care.

**Course Objectives**

At the end of this course the student will be able to:

- Identify the plane(s) of motion and axis(es) of rotation involved in a given human movement pattern
- Define terms related to linear kinematics and kinetics
- Analyze linear kinematic variables including velocity and acceleration in the context of human movement
- Use the equations of constant acceleration to solve problems regarding the motion of a projectile
- Solve mathematical problems to identify linear kinetic variables including force, momentum, impulse, work, power, and energy
- Define terms related to angular kinematics and kinetics
- Calculate angular velocity and angular acceleration
- Determine the linear velocity and acceleration of an object moving with angular motion
- Describe the three classes of levers and calculate the mechanical advantage of a lever
- Compute the torque generated by a given angular motion
- Recognize strategies to maintain equilibrium and stability during human movement
- Explain the unique forces present when human movement occurs in a fluid medium
- Describe the mechanical properties of connective tissues such as bone, ligament, muscle, and tendon
- Identify the class of a given skeletal articulation
- Classify human skeletal muscle based on its design
- Recognize the type of skeletal muscle contraction occurring in a given human movement
- Estimate the effect of increasing external loads on movement velocity
- Assess the tension generated within skeletal muscle at a given length of muscle

- Qualitatively and quantitatively analyze specific human motions or skills such as walking, running, jumping, landing, airborne motion, and throwing.

### **Required Textbooks**

Hall. *Basic Biomechanics 7<sup>th</sup> Edition*. McGraw-Hill. 2014

*Note: The publisher offers a “SmartBook” version of the text online at a reduced price and with enhanced features.*

*See <http://connect.customer.mheducation.com/products/connect-for-hall-basic-biomechanics-7e/>*

### **Grading**

<u>Assessment</u>	<u>Points</u>	<u>Weight</u>
Exam 1	50 points	15%
Exam 2	50 points	15%
Exam 3	50 points	15%
Final Exam	150 points	20%
Applied Biomechanics Assignments (10 x 10 points)	100 points	15%
Applied Biomechanics Project	50 points	15%
TopHat Questions/In-Class Assignments		5%
<b>Total</b>	<b><u>450 points</u></b>	<b><u>100%</u></b>

94.0% - 100% = A

90.0% - 93.99% = A-

87.0% - 89.99% = B+

80.0% - 86.99% = B

77.0% - 79.99% = C+

70.0% - 76.99% = C

67.0% - 69.99% = D+

60.0% - 66.99% = D

<60 = E

Information on current UF grading policies for assigning grade points:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

### **Quizzes and Exams**

There are ten applied biomechanics assignments, three semester exams, and a final exam. The three semester exams will not be comprehensive; however, the final exam WILL be comprehensive. Lecture Exams and Assignments will be administered through Canvas. All exams will be taken during the scheduled class time and in the classroom and will be closed-book and closed-notes. All exams will be taken on **Canvas ONLY**. It is the students' responsibility to ensure that their computers will connect successfully to UF wifi prior to all exams. If a student forgets to bring a computer on days of an exam, he/she will have the opportunity to retrieve their computers and attempt to finish the quiz or exam in the remaining time available. **HARD COPIES OF QUIZZES AND EXAMS WILL NOT BE AVAILABLE.**

Please see your instructor at least 72 hours prior to your exam if circumstances arise that will prevent you from taking the exam. If you have a schedule conflict for an exam you must take the exam early and not after the scheduled exam. Missed Exams will be scored a zero with no make-up exams permitted. There are no acceptable excuses for missing the final examination at the date and time scheduled for this class other than final examination conflicts causing a re-assignment by the Registrar.

### **Applied Biomechanics Assignments**

A total of 10 applied biomechanics assignments will be completed over the course of the semester. Weeks in which a homework assignment is due are denoted by an (\*) on the Class Schedule below. Homework assignments are due by **11:59PM SUNDAY** of the week they are assigned. These homework assignments will include questions that require students to apply lecture content to hypothetical cases or videos of athletic activities.

### **Applied Biomechanics Project**

Students will be allowed to choose from a collection of common athletic activities that they will be responsible for analyzing from both a biomechanical and an anatomical perspective. The project will consist of 5 distinct components (10 points each) and will be due by **Sunday, December 3<sup>rd</sup>, 2017**. Students will work individually to complete the project, but may seek guidance from classmates or the instructor as applicable. This project involves combining the components of the individual assignments given throughout the semester into one overall analysis of an athletic skill.

### **Class Attendance Policy**

Students are expected to attend all classes and to have completed assigned reading prior to class as scheduled by the instructor. Questions related to assigned readings will be available on Canvas. Students maintaining  $\geq 90\%$  average on these questions throughout the semester will earn 1% extra credit towards their final grade at the end of the semester (for example, an 89% final grade will become a 90% moving the student from a B+ to an A-).

### **Top Hat**

We will be using the Top Hat ([www.tophat.com](http://www.tophat.com)) classroom response system in class. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message. Questions administered in class count towards your final grade. Each lecture will include approximately 5 questions worth 1 point each (as participation points). In-class TopHat questions will amount to 1% of your final grade.

You can visit the Top Hat Overview (<https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide>) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.

An email invitation will be sent to you by email, but if don't receive this email, you can register by simply visiting our course website: <https://app.tophat.com/e/684625>

Note: our Course Join Code is 684625

Top Hat will require a paid subscription, and a full breakdown of all subscription options available can be found here: [www.tophat.com/pricing](http://www.tophat.com/pricing).

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email ([support@tophat.com](mailto:support@tophat.com)), the in app support button, or by calling 1-888-663-5491.

### **Grading**

Notification of final grades will be made by the Registrar or you may check your grade by using ISIS. Final grades will not be posted.

You must earn your grade! Grades will not be rounded! The extra credit opportunities are designed to help any individual with a borderline grade by demonstrating their commitment to the course.

Two extra credit opportunities are offered in this course. 1. Students maintaining a 90% average or greater on all assigned weekly reading questions will earn 1% towards their final grade. 2. Students maintaining a 90% average or greater on all weekly anatomy quizzes will earn 1% towards their final grade.

### **Cell Phone Policy**

Students in this course are expected to behave professionally, politely, and considerately. Cell phone use with regard to phone conversations, text messaging, and social media use during lectures, labs, and exams is banned in this class.

Smartphone or tablet devices may be used to participate in discussions and answer questions administered through TopHat.

### **Academic Honesty**

Cheating will not be tolerated in this course. All students are required to abide by the Academic Honesty Guidelines and Honor Code, which have been accepted by the University. Cheating is defined as the improper taking or tendering of any information or material, which shall be used to determine academic credit. Violations of the Honor Code will be handled according to the guidelines set by Student Judicial Affairs. 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 (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-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 me.

### **Accommodations for students with disabilities**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester

### **Online course evaluation process**

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc/Default.aspx>, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies

The University of Florida has enacted a policy of allowing NO food or drink of any kind in any campus classroom. This policy will be enforced during the meeting times of this course.

### **APK3220C - Class Schedule**

Please note that the instructor reserves the right to alter the syllabus or schedule if it is determined that such a change with benefit the course and the students.

Week	Dates	Topic	Chapter	Reading Due
1	(8/21-8/25)*	Introduction, Review of Syllabus What is Biomechanics Trigonometry and vector algebra	1 App A-C	8/23
2	(8/28-9/1)*	Kinematic Concepts Kinetic Concepts	2 3	8/28 8/30
3	(9/4-9/8)*	<b>Labor Day - NO CLASS MONDAY</b> Biomechanics of Bone	4	9/6
4	(9/11-9/15)*	Biomechanics of Joints <b>Exam 1 - Wednesday</b>	5	9/11
5	(9/18-9/22)*	Biomechanics of Muscle	6	9/18
6	(9/25-9/29)*	Equilibrium and Human Movement	13	9/25
7	(10/2-10/6)*	Linear Kinematics <b>Homecoming - NO CLASS FRIDAY 10/6</b>	10	10/2
8	(10/9-10/13)	Angular Kinematics <b>Exam 2 - Wednesday</b>	11	10/8
9	(10/16-10/20)*	Linear Kinetics	12	10/16
10	(10/23-10/27)*	Angular Kinetics	14	10/23
11	(10/30-11/3)*	Fluid Mechanics	15	10/30
12	(11/6-11/10)	<b>Exam 3 - Wednesday</b> <b>VERTERANS DAY - NO CLASS FRIDAY 11/10</b>		
13	(11/13-11/17)	Biomechanics of Upper Extremity	7	11/13
14	(11/20-11/24)	<b>THANKSGIVING - NO CLASS WED/FRI</b>		
15	(11/27-12/1)	Biomechanics of Lower Extremity	8	11/27
16	(12/4-12/6)	Biomechanics of Spine	9	12/4

**Final Exam**  
**Thursday, December 14, 2017 12:30-2:30PM**