George Mason University
College of Education and Human Development
Kinesiology

KINE 400.001 —Biomechanics
3 Credits, Fall 2021
T, R Noon – 1:15 PM, K. Johnson Hall 256 – SciTech Campus

Faculty

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Prerequisites/Corequisites

C or higher in BIOL 124, BIOL 125, ATEP 300, KINE 360.

University Catalog Course Description

Focuses on kinetic and kinematic concepts and how they apply to the quantitative assessment of human movement. Analyzes human movement and the functional dynamics of tissue such as muscle or bone.

Course Delivery Method

This course will be delivered using a mix of a lecture, discussion, lab, and/or hybrid (2-75% online). Other approaches may be used to facilitate learning, such as videos, demonstrations, and in-class activities. Overall, this will be a highly interactive class and students will be encouraged to participate.

Learner Outcomes or Objectives

This course is designed to enable students to do the following:

1) Describe and define movements and fundamental biomechanical principles using scientific terminology.
2) Define, recognize, and apply concepts of both linear and angular kinematics and kinetics as they apply to the analysis of human movement.

3) Recognize the equipment and techniques used for the quantitative assessment of human movement.
4) Apply biomechanical principles to human movement situations including but not limited to performance, training, rehabilitation, and injury prevention.
5) Evaluate the mechanics of exercises and activities as they affect the human body.
6) Apply principles related to internal tissue loading to improving tissue structure and function, and to injury prevention.

Professional Standards

This course meets the Commission on Accreditation of Allied Health Education Programs (CAAHEP) requirements and covers the following American College of Sports Medicine's Knowledge-Skills-Abilities (KSA's):

KSA	Description	Lecture, Lab, or both
	GENERAL POPULATION/CORE: EXERCISE PHYSIOLOGY AND RELATED EXERCISE SCIENCE	
1.1.4	Knowledge of the plane in which each movement action occurs and the responsible muscles.	Lecture
1.1.5	Knowledge of the interrelationships among center of gravity, base of support, balance, stability, posture, and proper spinal alignment.	Lecture
1.1.8	Knowledge of biomechanical principles that underlie performance of the following activities: walking, jogging, running, swimming, cycling, weight lifting, and carrying or moving objects.	Lecture
1.7.47	Ability to assess postural alignment and recommend appropriate exercise to meet individual needs and refer as necessary.	Lecture

Required Texts

McGinnis P. Biomechanics of Sport and Exercise, 4th ed. Champaign, IL: Human Kinetics; 2020.

Supplementary materials

Supplementary materials will be used in class and posted on BlackBoard/MyMason Portal. Please print these materials and bring them to class so that you have access to them when needed.

Course Performance Evaluation

Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard, VIA, hard copy).

Students will be evaluated on content standards (knowledge gained) and performance (demonstration of the content). Content standards will be assessed via exams and laboratory assignments. Performance will be assessed through completion of class activities. Once your FINAL GRADE, at the end of the semester is posted on mymasonportal/blackboard, you will have 24 hours to inquire about it. After that period, your grade will be posted as final on Patriot Web.

		Points
Assignments		
#1	Exam I	10
#2	Exam II	10
#3	Final Exam	15
#4	HW	10
#5	Lab Quizzes	10
#6	Lab Reports	25
#6	Lab Exam	10
#7	Professionalism	10
TOTAL		100

Grading Scale

A	= 94 – 100	B+	= 87 – 89	C+	= 77 – 79	D	= 60 – 69
A-	= 90 – 93	B	= 84 – 86	C	= 74 – 76	F	= 0 – 59
		B-	= 80 – 83	C-	= 70 – 73		

Notes:
1) Although a B- is a satisfactory grade for a course, students must maintain a 3.00 average in their degree program and present a 3.00 GPA on the courses listed on the graduation application.
2) Any student asking for their grade to be rounded up, increased a letter grade, extra credit only for themselves at the end of the semester, etc. may have their final average reduced by up to 2 points at the discretion of the instructor.

- **Assignments and/or Examinations**

Exams and Final Exam *(Course objectives 1, 2, 3, 4 & 6)*

Each student will be required to complete two exams and a final exam. The final exam will be cumulative. The format for all exams will be multiple choice, true/false, short essays, and problem-solving questions. Examinations represent inquiries regarding student knowledge of fact regarding course content. Examinations demonstrate that the student can remember and apply facts as well as demonstrate a hierarchy of knowledge information.

EXAM REVIEWS

As time allows in class and depending on class progress in each unit, a review *may* be offered before each exam. At that time, students can ask any content question that they would like. Students are not required to participate in the review, and can participate or leave as they choose. If there are no questions related to the content of the unit, the review session will be ended. Whether or not a review is conducted in class depends of class progress through the material for each unit *and* class participation in previous reviews. If there is no time to have a formal review or, if review sessions are not being utilized, students will need to come to office hours to address any questions on class material.

Labs, Lab Reports and Lab Exam *(Course objectives 1, 2, 3, 4, 5 & 6)*

The intent of the laboratories is to show how the theory learned in class can be applied to a variety of common activities. The labs will require students to work in small groups. During the lab sessions, data will be collected and a simple analysis will be performed. The labs will include questions regarding the results and several discussion questions. Each group must hand in **1** formal lab report, which will be due in class exactly **1** week after the lab is performed (aside from the introductory lab which will be due the next day). Lab reports must be typed and include a cover sheet. Only calculations or figures (not graphs) may be hand written. There will be 8 lab reports in total with each carrying the same weight towards the overall grade. The math review lab report will NOT count for your grade. There will be a lab exam at the end of the semester. The lab exam will cover content from all labs performed during the semester. Students should expect multiple choice, fill in the blank, and short answer questions as well as calculations from various labs.

Professionalism *(Course objectives 1, 2, 3, 4, 5 & 6)*

Students are expected to behave in a professional manner. Depending on the setting professionalism may look slightly different but generally consists of similar components. For undergraduate Kinesiology students in a classroom setting professionalism generally consists of the following components:

Attendance and Participation **(25% of Professionalism Grade)** – Show up on time to in-person and online class meetings, pay attention, and engage yourself in the lessons, discussions, class activities, etc. Demonstrate that you have an interest in the subject matter. Follow George Mason University policies for any missed classes. Arriving to class late or leaving early will be counted as an absence. Students are expected to show up prepared to class and participate during class activities. Students who know they will need to miss a class for a legitimate reason should contact the instructor before the class. Students who unexpectedly miss a class for an excused reason should contact the instructor within 24 hours of missing the class. Make-up tests, quizzes,

assignments, or other grades will be granted for excused absences only. Excused absences include: serious illness, official university excused absences and extenuating circumstances. It is the student's responsibility to contact the instructor in order to obtain the make-up work.

Discussion Board **(50% of Professionalism Grade)** – Students are required to author a minimum amount of original discussion board post during the semester. In addition, students are expected to respond/comment on a minimum of 3 unique posts by colleagues during the semester. Detailed instruction is available on blackboard.

Communication **(25% of Professionalism Grade)** – When communicating with the instructor and classmates, either face-to-face or via email, students should address the other person appropriately, use appropriate language and maintain a pleasant demeanor.

Technology Use During Class

As per GMU policy, all sound emitting technology is required to be turned off during the class meeting time. No sound emitting technology (e.g., cell phones, smart phones, iPads, Tablets, pagers, etc.) is allowed at any time during the class period. Students who are observed using any form of technology inappropriately (e.g., sending text messages from cell phones, visiting social networking sites from laptops, etc) will be dismissed from class for the day, counted as an absence, and not permitted to make up missed assignments. Additionally, no laptop computers (e.g., netbooks, notebooks, etc.) will be permitted for use during class time unless with permission from the instructor.

Professional Dispositions

See https://cehd.gmu.edu/students/polices-procedures/

Students are held to the standards of the George Mason University Honor Code. You are expected to attend all class sections, actively participate in class discussions, complete in-class exercises and fulfill all assignments. Make-up tests, quizzes, assignments, or other grades will be granted for excused absences only. Excused absences include serious illness, official university excused absences and extenuating circumstances. It is the student's responsibility to contact the instructor in order to obtain the make-up work.

No late work will be accepted in this course without a submitted extension request. The extension request must be submitted in place of the assignment, to the course instructor, by the assignment deadline. Extension requests must be submitted with an explanation as to why the student is unable to complete the assignment on time. No extension requests will be granted if submitted after the assignment deadline. Students are allowed one 24-hour extension per course. Extensions approved beyond 24 hours are at the discretion of the instructor. Extensions cannot be requested for exams or presentations. In dire or extenuating circumstances, students may be allotted additional extensions or make up opportunities at the instructor's discretion.

Class Schedule

	Date		Topic	Assigned readings	Assignments & Due Dates
Module 1	Week 1	8/23-28	Course Introduction and Musculoskeletal Review	Introduction Chapter Chapters 10, 11&12	
			Lab 1 – Introduction *Location: Meet in classroom*	*Review Paper – The biomechanics of running*	Weekly discussion board post
	Week 2	8/29-9/4	Linear Kinematics	Chapter 2 pp 49-66	
			Lab 2 - Linear Kinematics *Location: Meet in classroom*	*A kinematics analysis of three best 100 m performance ever*	**Lab 1 Due 9/2** Weekly discussion board post
Module 2	Week 3	9/5-9/11	Projectile Motion	Chapter 2 pp 66-78	
			Lab 3 - Projectile Motion *Location: Meet in classroom*	*Physics of Basketball*	**Lab 2 Due 9/9** **HW 1 Due 9/11** Weekly discussion board post
	Week 4	9/12-9/18	Forces	Chapter 1	
			Lab 4 – Ground Reaction Forces *Location: SMART Lab – 9438 Innovation Loop*	**See articles on Blackboard*	**Lab 3 Due 9/16** Weekly discussion board post
	Week 5	9/19-9/25	Linear Kinetics	Chapter 3	
			Practice Problems/Calculations *Location: Meet in classroom*		**Lab 4 Due 9/23** Weekly discussion board post
Module	Week 6	9/26-10/2	Work, Power, Energy	Chapter 4	

			Lab 5 – Work, Power, Energy *Location: SMART Lab – 9438 Innovation Loop*	**See articles on Blackboard*	**HW 2 Due 10/2** Weekly discussion board post
	Week 7	10/3-10/9	Fluid Mechanics	Chapter 8	
			Exam Review		**Lab 5 Due 10/7**
	Week 8	10/10-10/16	No Class		
			Exam #1		Weekly discussion board post
Module 4	Week 9	10/17-10/23	Angular Kinematics	Chapter 6	
			Lab 6 – Angular Kinematics *Location: TBD*	**See articles on Blackboard*	**HW 3 Due 10/23** Weekly discussion board post
	Week 10	10/24-10/30	Torques and Moments of Force	Chapter 5	
			Lab 7 – COM and Angular Momentum *Location: SMART Lab – 9438 Innovation Loop*		**Lab 6 Due 10/28** Weekly discussion board post
	Week 11	10/31-11/6	Angular Kinetics	Chapter 7	
			Math/Calculations *Location: Meet in classroom*		**Lab 7 Due 11/4** **HW 4 Due 11/6** Weekly discussion board post
Module	Week 12	11/7-11/13	Mechanical Properties of Biological Tissues	Chapter 9	

			Lab 8 –Mechanical Properties of Biological Tissues *Location: Meet in classroom*	*Femur fractures resulting from stair falls among children: an injury plausibility model*	
	Week 13	11/14-11/20	Exam 2 review		
			Exam #2		**Lab 8 Due 11/18**
	Week 14	11/21-11/27	Lab 9 – Isokinetic		
			Thanksgiving - No Class Meeting		
	Week 15	11/28-12/4	Lab 10 – EMG	**See articles on Blackboard*	**Lab 9 Due 12/2**
			Lab Exam Review		
	Week 16	*Exam Period*	**Lab Exam** **Final Exam**		**Lab 10 Due 12/9** **Final Exam 12/9 @ 10:30AM**

Note: Faculty reserves the right to alter the schedule as necessary, with notification to students.

Core Values Commitment

The College of Education and Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: http://cehd.gmu.edu/values/.

GMU Policies and Resources for Students

Policies

- Students must adhere to the guidelines of the Mason Honor Code (see https://catalog.gmu.edu/policies/honor-code-system/).

- Students must follow the university policy for Responsible Use of Computing (see https://universitypolicy.gmu.edu/policies/responsible-use-of-computing/).

- Students are responsible for the content of university communications sent to their Mason email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students **solely** through their Mason email account.

- Students with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see https://ds.gmu.edu/).

- Students must silence all sound emitting devices during class unless otherwise authorized by the instructor.

Campus Resources

- Support for submission of assignments to VIA should be directed to viahelp@gmu.edu or https://cehd.gmu.edu/aero/assessments. Questions or concerns regarding use of Blackboard should be directed to https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/.

- For information on student support resources on campus, see https://ctfe.gmu.edu/teaching/student-support-resources-on-campus

Notice of mandatory reporting of sexual assault, interpersonal violence, and stalking:

As a faculty member, I am designated as a "Responsible Employee," and must report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per University Policy 1202. If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-380-1434 or Counseling and Psychological Services (CAPS) at 703-993-2380. You may also seek assistance from Mason's Title IX Coordinator by calling 703-993-8730, or emailing titleix@gmu.edu.

For additional information on the College of Education and Human Development, please visit our website https://cehd.gmu.edu/students/

Student Acknowledgement of Syllabus

I, _____, by signing below, attest to the following:
(Print First and Last Name)

*I have read the course syllabus for KINE 400 in its entirety, and I understand the policies contained therein. This syllabus serves as a binding contract for KINE 400 between the instructor and me.
*I have a clear understanding of the due dates for assignments and examinations, and I accept responsibility for the material.
*I am aware that failure to submit assignments by the dates assigned will result in no points awarded as late work will not be accepted.
*I understand that if I am using emitting sound technology or personal computers I will be dismissed from class for the day, counted as an absence, and not permitted to make up missed assignments
*I understand the instructor reserves the right to alter the provided schedules as necessary and I am responsible for the assignments and examination dates for the most current version of the syllabus schedule.
*I accept responsibility for reading announcements that are sent to me via e-mail through BlackBoard/MyMason Portal; it is my responsibility to access my Blackboard/MyMason Portal e-mail for messages, or forward Blackboard/MyMason Portal e-mail as per the directions provided in the syllabus.
*Points cannot be earned in this class until you have signed and handed this form to the instructor.

_____ _____
(Signature) **(Date)**

(Student Copy: This copy should remain attached to your syllabus)

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*Points cannot be earned in this class until you have signed and handed this form to the instructor.

_____ _____
(Signature) **(Date)**

(Instructor Copy: Submit to the instructor at the end of the first class meeting)