# George Mason University College of Education and Human Development Master in Kinesiology

KINE 603.003 – Applied Biomechanics 3 Credits, Fall 2024 T, R: Noon – 1:15PM Colgan Hall Room 302 – SciTech Campus

# **Faculty**

Name: Oladipo Eddo, PhD Office Hours: By appointment

Office Location: 201B K. Johnson Hall

Office Phone: 703-993-7183 Email Address: oeddo@gmu.edu

### **Prerequisites/Corequisites**

Admission to the Kinesiology MS graduate program or approval of course instructor.

# **University Catalog Course Description**

Examines biomechanical theory and the application of mechanics to understand human movement across the lifespan and ability level.

#### **Course Overview**

This course will provide advanced knowledge in kinetics, kinematics and mechanical properties of tissues in order to provide an understanding of the function of the human body. Current scientific literature will be used to teach evidence-based approaches to perform data collection, analysis and interpretation for clinical or research biomechanical purposes. Throughout the course an emphasis will be placed on motion analysis, ground reaction forces, and electromyography.

#### **Course Delivery Method**

This course will be delivered using lecture, lab, seminar formats and hybrid online formats.

# **Learning Outcomes**

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

- 1. Describe and explain concepts and theory from kinetics, kinematics and mechanical properties of tissues as it relates to human movement.
- 2. Apply laws relating forces, inertial properties of the body and motion to common human movements.
- 3. Quantify human motion using methods common in the field of biomechanics.
- 4. Analyze and evaluate human movement data, collected from kinematic, kinetic and electromyographic analysis.
- 5. Evaluate current research in the field of biomechanics.

#### **Required Texts**

Biomechanics and motor control of human movement. 5th ed. Hoboken, N.J.: Wiley; 2023.

ISBN: 978-1-119-82702-3

#### Additional article readings:

TBD – as assigned by instructor.

# **Optional/Suggested Texts:**

Foundational Knowledge – McGinnis, Peter. Biomechanics of Sport and Exercise. 4<sup>th</sup> Edition, Human Kinetics (2021): ISBN 13: 9781492571407

#### Advanced Concepts -

Robertson G, Caldwell G, Hamill J, Kamen G, Whittlesey S. *Research methods in biomechanics*, 2E. Human Kinetics; 2013.

#### **Course Performance Evaluation**

Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard, Tk20, hard copy).

- Research Article Presentation The intent of this assignment is to develop your presentation skills and ability to relate course content to existing body of literature. Students will select an original article from a list provided and present relevant information to the class during a 10-12 minutes presentation session.
- Assignments Throughout the semester assignments will be required to be completed prior to
  class. These will assist you in reviewing key concepts, preparing for class and studying for the
  final exam.

#### Mid-Term and Final Exam

Each student will be required to complete a mid-term exam 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.

#### **Research Article Presentation**

• The intent of this assignment is to develop your presentation skills and ability to relate course content to existing body of literature. Students will select an original article from a list provided and present relevant information to the class during a 10-12 minute presentation session.

#### o Labs

There will be <u>5</u> labs with formal lab reports due during the semester. These are intended to give students hands-on, practical experience with concepts that are covered in class. The data will be collected in class. For each lab students will be required to write a formal lab report will be due approximately one week after performing the lab. Lab reports must be typed and include a cover page.

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#### Exam Reviews

As time allows in class and depending on class progress in each unit, a review <u>may</u> <u>be</u> offered before each exam. At that time, students can ask any <u>content</u> question that they would like. If there are no questions related to the <u>content</u> of the unit, the review session will be ended. Whether or not a review is conducted in class depends on 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.

# o Attendance and Participation

Regularly attending class is mandatory and will count towards the final grade in the class. Participation during the activity labs is mandatory. Participation does not necessarily mean performing the physical activity – lab groups will need members to perform the physical activity, instruct the person performing the activity, take measurements, and record data.

#### Final Grades:

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. This course will be graded on a point system, with a total of 100 possible points.

#### • Other Requirements

#### Attendance

■ Students are expected to be on time, attend all class meetings and be prepared for in class assignments and projects. Excused absences include the following: illness (must bring a receipt or note from a doctor), family death, athletic/academic event, and others at the discretion of the instructor. For known upcoming absences, students must contact the instructor at least one week in advance to the missed class to make up work. In the case of illness or some other unforeseen absence, the student must contact the instructor via e-mail or telephone. At the next attended class meeting the student will discuss material that is to be completed. It is the student's obligation to pursue any make-up work.

#### Academic Load

• Although many students must work to meet living expenses, employment and personal responsibilities are not acceptable reasons for late arrivals, missed classes, or incomplete assignments. Employment must not take priority over academic responsibilities. For additional information on this subject, please see the GMU Academic Catalog (<a href="http://catalog.gmu.edu/content.php?catoid=5&navoid=104#Registration\_attendance">http://catalog.gmu.edu/content.php?catoid=5&navoid=104#Registration\_attendance</a>). Students failing to observe these guidelines should expect no special consideration for academic problems arising from the pressures of employment.

#### o Honor Code

 Students are held to the standards of the George Mason University Honor Code (see http://honorcode.gmu.edu for details). Violations, including cheating and plagiarism, will be reported to the Honor Committee. Student assignments may be put through plagiarism detecting software.

# Written Assignments

- All assignments must be typed in Microsoft Word, and formatted as follows (*unless otherwise specified*): double spaced, 12 point Times New Roman font, 1 inch margins, your name and title in the running header at top left had corner, continuous line numbers on left margin, and page numbers centered in footer. Failure to comply with any or all parts of this format will result in an unacceptable assignment, which corresponds to zero (0) points.
- Pay close attention to spelling and grammar as these will count towards your grade on written assignments. American Medical Association Manual (AMA) of Style (10<sup>th</sup> edition) format must be used for all written work in this class (e.g., in referencing, creation of tables, and formatting headers for paper sections).
- Assignments must be turned in on Blackboard/MyMason Portal by the beginning of class on the specified date due (*unless otherwise specified*). No late assignments will be accepted. It is recommended that students keep copies of all submitted work.

# 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.

#### o E-mail Correspondence

Only messages that originate from a George Mason University address will be accepted. Please address the subject line for all email pertaining to this course as: KINE 603: Last Name – purpose of email. The following is an appropriate professional format:

Subject: KINE 603: Help with (fill in the blank)

Dear Dr. Eddo, (Introductory salutation)

I have a question regarding one of the assignments. (Text body)

Regards, (Ending Salutation)

Mr. / Mrs. Student (Your name)

*Note:* All email will be responded to in the order in which it is received. Students should allow 48 hours for a response.

#### Facilities

- We are very fortunate to have our own human motion analysis equipment in the Sports Medicine Assessment Research & Testing (SMART) Laboratory. It is imperative that all people who utilize the labs treat the facilities and equipment with respect and care.
  - 1. All laboratory equipment is highly sensitive and quite expensive. No horseplay will be allowed in the laboratory
  - 2. If you are working with a piece of equipment and it breaks or something is not working properly, please notify one of the instructors immediately so it can be fixed.
  - 3. Please make sure to turn off all equipment when you are finished even if it was on when you started. Lab doors should be locked and lights should be turned off when you exit the lab.
  - 4. Computer data is highly sensitive to viruses, thus all disks must be "clean" and checked for viruses prior to utilization for laboratory experiments. It is each student's responsibility to prevent computer malfunctions from occurring.
  - 5. Eating, drinking, chewing gum and smoking are not permitted in the testing section of the laboratory.

#### Grading

• Assignment		Points
Mid-Term Exam #1		20
Final Exam		25
Research Article Presentation		15
Labs		30
Attendance and Participation		10
	Total	100

The student's final letter grade will be earned based on the following scale:

Grade	Percentage
A	94 - 100%
A-	90 - 93%

B+	88 - 89%
В	84 - 87%
B-	80 - 83%
C	70 - 79%
F	0 - 69%

Note: \* 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.

#### **Use of Generative AI**

Any text generated by an artificial intelligence (AI) text-generation tool (such as ChatGPT) is not accepted in this class as "the student's own work," and so will be considered similarly to text published on paper or online or text composed or significantly edited/altered by another person. The use of such text without proper attribution is a violation of academic integrity.

# **Professional Dispositions (CEHD Student Guide)**

Throughout study in the College of Education and Human Development, students are expected to demonstrate behaviors that reflect the positive dispositions of a professional. See <a href="https://cehd.gmu.edu/current-students/cehd-student-guide">https://cehd.gmu.edu/current-students/cehd-student-guide</a>.

#### **Class Schedule**

Week	Date	Topic	Due		
	Introductory Module				
Week 1	Aug 27	Course Overview and Introduction			
	Aug 29	Introduction Musculoskeletal Biomechanics	Winter Chapter 1  Biomechanics Inventory Quiz - Due Midnight Aug 31		
		Module 1: Anthropometry			
Week 2	Sept 3	Anthropometry Body segment parameters	Winter Chapter 4  Article(s) on Blackboard  Prior to Class		
	Sept 5	, c 1	Date and Topic Selection		
Week 3	Sept 10	Calculations	Article(s) on Blackboard Prior to Class		
	Sept 12	Lab 1			
Week 4	Sept 17	Lab 2			

	Sept 19	Article Presentations (3)	Lab 1 Due
		Module 2: Kinematics	
W 1.5	Sept 24	Linear Kinematics	Lab 2 Due Winter Chapter 3
Week 5	Sept 26	Linear Kinematics	Article(s) on Blackboard Prior to Class
Week 6	Oct 1	Angular Kinematics	
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	Oct 8	Lab 3	
Week 7	Oct 10	Article Presentations (3)	Exam 1
		Module 3: Kinetics	
Week 8	Oct 15	Linear Kinetics	Lab 3 Due
	Oct 17		Article(s) on Blackboard Prior to Class
Week 9	Oct 22	Angular Kinetics	
	Oct 24		
Week 10	Oct 29	Lab 4	
	Oct 31	Article Presentations (3)	
***		Module 4: Musculoskeletal Biomechanics & Modeling	
Week 11	Nov 5*	No class	Lab 4 Due Winter Chapter 5
	Nov 7	Inverse Dynamics	Article(s) on Blackboard Prior to Class
Week 12	Nov 12	Inverse Dynamics	
	Nov 14	Calculations	
Week 13	Nov 19	Article Presentations (3)	

	Nov 21	Forward Dynamics	
Week 14	Nov 26	Forward Dynamics	Winter Chapter 10  Article(s) on Blackboard
	Nov 28*	No class - Thanksgiving	Prior to Class
Week 15	Dec 3	Forward Dynamics : Opensim Lab 5	
	Dec 5	Article Presentations (3)	
Final	Dec 12	FINAL EXAM	OpenSim Modules Due by Midnight Dec 7

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

#### **CEHD Commitments**

The College of Education and Human Development is committed to fostering collaboration and community, promoting justice and equity, and advancing research-informed practice. Students are expected to adhere to, and contribute to, these commitments, the CEHD Mission, and Core Values of George Mason University. More information can be found here: https://cehd.gmu.edu/about/culture/

#### **GMU Policies and Resources for Students**

#### **Policies**

- Students must adhere to Mason's Academic Standards (see <a href="https://catalog.gmu.edu/policies/academic-standards/">https://catalog.gmu.edu/policies/academic-standards/</a>)
- Students must follow the university policy for Responsible Use of Computing (see <a href="https://universitypolicy.gmu.edu/policies/responsible-use-of-computing/">https://universitypolicy.gmu.edu/policies/responsible-use-of-computing/</a>).
- 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 <a href="https://ds.gmu.edu/">https://ds.gmu.edu/</a>).
- 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 <a href="mailto:viahelp@gmu.edu">viahelp@gmu.edu</a> or <a href="https://cehd.gmu.edu/aero/assessments">https://cehd.gmu.edu/aero/assessments</a>.
- Questions or concerns regarding use of your LMS should be directed to:
  - o Blackboard Learn: <a href="https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/">https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/</a>
  - o Canvas: <a href="https://its.gmu.edu/service/canvas/">https://its.gmu.edu/service/canvas/</a>
- For information on student support resources on campus, see:
  - https://ctfe.gmu.edu/teaching/student-support-resources-on-campus
    - o TimelyCare: <a href="https://caps.gmu.edu/timelycare-services/">https://caps.gmu.edu/timelycare-services/</a>
    - o Writing Center: <a href="https://writingcenter.gmu.edu/">https://writingcenter.gmu.edu/</a>
- For additional information on the College of Education and Human Development's Student Success Resources, please visit: <a href="https://cehd.gmu.edu/students/">https://cehd.gmu.edu/students/</a>.

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

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