

GEORGE MASON UNIVERSITY
School of Recreation, Health, and Tourism

EFHP 613— Advanced Applied Biomechanics (3)
Spring 2015

DAY/TIME:	TR 12:00 – 1:15 PM	LOCATION:	PW – 249 Bull Run Hall
PROFESSOR:	Dr. Nelson Cortes	EMAIL ADDRESS:	ncortes@gmu.edu
OFFICE LOCATION:	208 Bull Run Hall	PHONE NUMBER:	703-993-9257
OFFICE HOURS:	By appointment	FAX NUMBER:	703-993-2025

PREREQUISITES

Full admission to EFHP graduate program. Introductory Biomechanics, Basic Human Anatomy, and Physics or permission of instructor

COURSE DESCRIPTION

Focuses on kinetic and kinematic concepts and how they apply to the qualitative and quantitative assessment of human movement. Designed for advanced study of motion analysis techniques

COURSE OBJECTIVES

The course will introduce students to the basic concepts and analysis techniques used in biomechanics with a focus on the analysis of human movement. As a result of this course and its activities the student should:

1. Demonstrate the knowledge set-up, collection, and interpretation of 2-D motion analysis.
2. Demonstrate the knowledge set-up, collection, and interpretation of 3-D motion analysis.
3. Demonstrate the knowledge set-up, collection, and interpretation of force plate analysis.
4. Demonstrate the knowledge set-up, collection, and interpretation of electromyography
5. Demonstrate the ability to communicate effectively the quantitative analysis of complex motor movements.
6. Demonstrate a comprehensive understanding of human movement through biomechanical analysis.
7. Demonstrate the ability objectively quantify and evaluate movement tasks relevant to human motion.

COURSE OVERVIEW

This is a course to assist the human movement scientist (e.g., sports medicine clinician, exercise science, strength and conditioning) to enhance his/her ability to understand the nature of the structure and function of the human body through quantitative analysis of human motion. This course is intended to provide future clinicians/researchers with the necessary knowledge base to objectively evaluate human motion and to understand the theory, concepts and application of conducting analysis of human motion. The intent of this course is to provide students with an extensive knowledge concerning quantitative analysis of human motion and the concepts and equipment to collect objective quantifiable data to be used for clinical or research purposes. Lecture and laboratory concepts will be utilized to instruct students on the foundations of biomechanical data collection and major emphasis will be placed on using 2-D and 3-D motion analysis, forceplates, and electromyography. As is the case in any biomechanical analysis of human motion instrumentation course, each student should expect to spend several additional hours each week in the laboratory over and above those scheduled as class time.

NATURE OF COURSE DELIVERY

This course is delivered through classroom instruction (face to face), and online assignments. A variety of teaching methods will be used. These include: lectures, class discussions, videos, demonstrations and in-class activities. PowerPoint files will NOT be posted online.

Class Material

I use a combination of approaches to assist your learning. These include reading assignments and discussion of the reading, learning activities that provide practical experience in biomechanics, analyzing research examples, and homework preparing various elements of a research project. You are encouraged to ask questions about the assigned reading, followed by discussion and learning activities. This means you must read the material before the class! Be prepared to be called on at random regarding the readings and any other material.

Attendance and Participation

Attendance is **required** for this class. Arriving to class late or leaving early will be count 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.

Academic Load

In addition to attending the lectures there will be regular homework assignments and projects that may require anywhere from 2-10 hours of work per week. Additionally, regular readings will be assigned to students. Students are expected to complete all outside work on time. Extensions will not be granted on assignments unless an extenuating circumstance arises. Students may be asked to provide official documentation in certain instances. The purpose of the assignments is to aid students in learning the material.

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.

Assignments

All assignments must be typed in Microsoft Word, unless when specifically told not to. A loss of points may occur for improper grammar and spelling. It is recommended students save all assignments on their personal computers and/or a back-up device.

Instructional Procedures:

The course is designed as a combination of lecture and self-discovery guided learning experiences. It will be imperative that each student reviews the material from the preceding lectures and completes the assigned readings prior to lecture and laboratory sessions.

Facilities & Additional Information:

We are very fortunate to have state-of-the-art 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 the instructor 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.

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.

Correspondence

The preferred method of communication outside of class is email. Emails should originate from a George Mason email account and be in a professional format (i.e., emails should not look like a text message!). Emails with no text in the body will not be acknowledged.

Dear Dr. Cortes (*Beginning salutation*)

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

Regards, (*Ending Salutation*)

“John Doe” (*Your name*)

REQUIRED READINGS

- 1) McGinnis, Peter. Biomechanics of Sport and Exercise. 3rd Edition, Human Kinetics (2013)
- 1.1) MaxTraq: <http://www.motionanalysisproducts.com/Books/PM-BSE-R3.html> - comes with the book, and is a required software to use for the research project.

EVALUATION

Mid-Term Exams and Final Exam

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.

Research Project

The research project provides experience in developing an in-depth understanding of a movement with application of neuromechanical/biomechanical concepts. It enhances communication (oral and written) skills, as it is important in the development of the professional student. It also stimulates critical thought process to develop the methodology of a study to assess that problem. Research project format will be distributed on blackboard.

Research Project Presentation

The intent of this assignment is for you to share your research project with your colleagues via a 10-minute PowerPoint presentation. This assignment will allow you to gain experience in oral presentation skills. As part of the experience, your colleagues and I may ask questions about your study.

Labs

There will be 5 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.

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. 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.

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.

NAME

Your name **MUST** be on ALL of your papers/exams when you turn them in. Failure to put your name will result in a 0 for the assignment/exams.

GRADING

Every attempt will be made to grade and return assignments in a timely manner to provide students with constructive feedback. To provide students the opportunity to fully assess the feedback provided on graded assignments, the professor will be happy to answer any questions at the next class period following the return of the assignments or during the professor's office hours. The professor acknowledges the passion with regards to grades, but unprofessional and uncivil behavior either in person or through other modes of communication will not be tolerated.

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.

Assignment	Points
Mid-Term Exam #1	10
Mid-Term Exam #2	10
Final Exam	20
Research Project	20
Research Project Presentation	20
Labs (5)	15
Attendance and Participation	5
Total	100

Grade	Percentage	Quality Points	Grade	Percentage	Quality Points
A	93%	4.00	B-	80%	2.67*
A-	90%	3.67	C	73%	2.00
B+	87%	3.33	F	<73%	0.00
B	83%	3.00			

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.

TENTATIVE COURSE SCHEDULE

DATE				TOPIC	READINGS/ASSIGNMENT DUE
#1	T	January	20	Introduction to EFHP 613; Why study biomechanics?	Introduction Chapter
#2	R	January	22	Math Review	
#3	T	January	27	Biomechanics of Muscles, Tendons, Ligaments, and Bone	Chapter 10, 11, & 12 Blackboard Readings
#4	R	January	29	Lab #1 – Functional Movement Screens and Joint ROM Assessment	FAFC Lab
#5	T	February	3	Linear Kinematics	Chapter 02
#6	R	February	5	Lab #2 – Biomaterials (Mr. Eddo)	Lab #1 Due
#7	T	February	10	Linear Kinematics; Practice problems	Chapter 02
#8	R	February	12	Angular Kinematics	Chapter 06 Lab #2 Due
#9	T	February	17	Angular Kinematics; Practice problems	Chapter 06
#10	R	February	19	Lab #3 –Kinematics	
#11	T	February	24	Article Review Review for Mid-Term Exam #1	Article #1 on Blackboard – Novacheck 1998 Gait Posture Biomechanics of Running
#12	R	February	26	Mid-Term Exam #1	Lab #3 Due
#13	T	March	3	Linear Kinetics / Go over Mid-Term Exam #1	Chapter 03
#14	R	March	5	Linear Kinetics; Practice problems	Chapter 03
	T	March	10	Spring Break – No Class	
	R	March	12	Spring Break – No Class	
#15	T	March	17	Angular Kinetics	Chapter 05 & 07

DATE				TOPIC	READINGS/ASSIGNMENT DUE
#16	R	March	19	Angular Kinetics; Practice problems	Chapter 05 & 07
#17	T	March	24	Force Plates; Lab #4 - Kinetics	Chapter 05 & 07
#18	R	March	26	Article Review / Review for Mid-Term Exam #2	Article #2 on Blackboard – TBD
#19	T	March	31	Mid-Term Exam #2	Lab #4 Due
#20	R	April	2	Biomechanical Data Processing / Go over Mid-Term Exam #2	Chapter 16
#21	T	April	7	Lab #5 – Musculoskeletal Modeling using OpenSim (Dr. Joel Martin)	
#22	R	April	9	EMG and Ultrasound	SMART Lab Innovation Chapter 16
#23	T	April	14	Video Analysis – Data Collection Run SMART Clinic	FAFC Lab Chapter 16 Lab #5 Due
#24	R	April	16	Video Analysis – Data Processing	Chapter 16
#25	T	April	21	In-Class Work Day	
#26	R	April	23	In-Class Work Day	
#27	T	April	28	Presentations	Research Project Presentations Due
#28	R	April	30	Presentations	Research Project Final Paper Due
	R	May	7	Final Exam (10:30AM–1:15PM)	

Note: Faculty reserves the right to alter the schedule as necessary.

ACADEMIC INTEGRITY

Students are expected to follow the George Mason University Honor Code. All assignments are subject to evaluation under plagiarism detection software. In the event that students hand in written assignments that are identical to another students' assignment both students will be given a zero for the assignment.

Student Expectations

- *Students must adhere to the guidelines of the George Mason University Honor Code [See <http://oai.gmu.edu/the-mason-honor-code-2/>]*
- *Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See <http://ods.gmu.edu/>].*
- *Students must follow the university policy for Responsible Use of Computing [See <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>]*
- *Students are responsible for the content of university communications sent to their George Mason University 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 must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.*

Campus Resources

- *The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See <http://caps.gmu.edu/>].*
- *The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See <http://writingcenter.gmu.edu/>].*
- *For additional information on the College of Education and Human Development, School of Recreation, Health, and Tourism, please visit our website [See <http://rht.gmu.edu>]*

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.

