University of Southern California – Department of Biological Sciences
HBIO-408L* –Biomechanics (4 Units) Fall 2014
http://www.usc.edu/dept/LAS/kinesiology/exsc408l/lab/lab.html

Instructors: Jill McNitt-Gray, Ph.D. mcnitt@usc.edu
Lecture: VKC102 M/W 2:00 – 3:20 P.M; Comprehensive Final: Friday 12/12, 2:00–4:00 PM
Office Hours: MON / WED, 3:20-4:20 PM (Bring lab notebook to office hour meetings).
Laboratory: 3 hours/week 2:00 – 4:50 T PED B16
5:00 – 7:50 T PED B16
2:00 – 4:50 Th PED B16

***Course includes project-based capstone experience**
Kinematic and kinetic analysis of human motion; emphasis on performance enhancement and injury prevention. Concepts from high school algebra (word problems and solving for an unknown) and the use of sine, cosine, and tangent concepts from trigonometry. Calculus is not required.
Prerequisite: EXSC 301L and 1 from (MATH 108 or MATH 125) and 1 from (PHYS 135a or PHYS 151)
Required Texts and Supplies:
1. Web-Based Lecture Notes
2. Selected Literature Readings available through PubMed@usc through USC Library
3. Electronic Storage Device (back up and store homework, labs, and project content)

Course Reader *(Optional)*

I. Objectives:
1. Develop critical thinking and analytical skills to solve meaningful problems; use Newton's Laws to understand cause-effect relationships governing human movement.
2. Improve oral, written, electronic information and communication skills.
3. Gain hands-on experience analyzing motion and quantifying and interpreting biomechanical information in scientific, ethical, social, and environment related contexts.

II. Grading Procedures:
1. Exam 1 - 20%
2. Exam 2 - 20%
3. Comprehensive Final - 25%
4. Lab - 20%
5. Project - 15%

Lab Grading:
1. Pre/Post Lab Reports, Demonstrations, - 50%
2. Weekly Lab Quizzes - 25%
3. Practical - 25%

Grading Scale: >90%=A,> 80%=B, >70%=C, >65%=D, otherwise =F

III. Laboratory Component
Lab Director: Emi Embler, Ph.D.
Email: eembler@usc.edu

Teaching Assistants:
Chris Ramos (rchristo@usc.edu) Office hours PED B9
Ian Russell (irussell@usc.edu) Office hours PED B9

IV. Expectations

1. Come prepared for class and labs (lecture pop quizzes).
2. Sincere Personal Investment in independent discovery and lab activities.
3. USC conduct code (you must do your own work!) - Refer to **SCampus** Academic Integrity Section.
4. Excused absences require written notification *one week in advance.*
5. Honor due dates in lab and lecture **(anything turned in after due date = zero points).**
6. Email and class participation.

VI. Project Overview and Grading

Project: Identify significant problem (compare/contrast), generate a meaningful hypothesis, design and conduct a biomechanical experiment to test hypothesis (limitation of analysis: two 2D planar movements).

Project Grade:

1. Background/Significance (10%) *Problem? known/unknown in peer reviewed literature?*
2. Kinematics (angle-angle) (25%) *kinematic context for muscle force generation*
3. Kinetics (whole body: imp/mom (25%); joint kinetics (25%) *cause/effect at joint &CM levels*
4. Presentation and hand-in materials (15%); *all comparisons specific to research question*
   a) 3 related scientific journal articles (.pdf emailed to TA prior to presentation)
   b) hand written Free Body Diagrams and associated calculations (show all work)
   c) Paper copy of presentation (must be able to read all text on figures)
   d) Peer evaluation (emailed to TA prior to presentation)

VII. Academic Accommodations:

Any student requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (the instructor) as early in the semester as possible. DSP is located in Student Union (STU) 301 and is open 8:30-5:00pm Monday – Friday. The phone number for DSP is (213) 740-0776.

VIII. Academic Integrity:

Students who violate University standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the University. Since dishonesty in any form harms the individual, other students and the University, academic integrity policies will be strictly enforced. I expect you will familiarize yourself with the Academic Integrity guidelines found in the current SCampus.

IX. Academic Integrity Violations:

- Academic dishonesty/misconduct (plagiarism, cheating, unauthorized collaboration, etc.) will not be tolerated. All academic integrity violations will result in a grade sanction and will be reported to the Office for Student Judicial Affairs. It is your responsibility to "reasonably" protect your own work from the plagiarism of others.
- If plagiarism is detected on a group project, all members of the group will be held responsible.
- You are expected to be familiar with the Academic Integrity guidelines found in the current SCampus (student guidebook). An electronic version is available at http://usc.edu/scampus.

Week of*	*Syllabus may be modified as needed Monday	Wednesday	Practice with problem solving Homework	Lab Exercises	Project Progression*: Understanding Cause-Effect *Integrate knowledge each week
1 8/25	Cause-effect analysis, FBD	kinematics- linear, angular muscle force	Trig, linear motion	introduction/ computer skills, FBD	Microsoft Excel, Kinovea (PC), Ubersense (MAC) * develop proficiency
2 9/1	***Labor Day***	Motion analysis Mechanical Objectives	Center of mass	linear kinematics & TBCM (video clips)	** identify real world problems & critical questions that are meaningful to you!!
3 9/8	Linear Impulse, FBD	Projectile motion	projectile motion	angular kinematics	** finalize movements of interest and begin extensive research on topic- **what? how?**
4 9/15	Angular Impulse, FBD	Integration of Concepts, FBD	linear impulse	linear impulse & momentum	** critically read literature, pilot, develop hypotheses and experimental design - **why?**
5 9/22	Integration of Concepts,FBD	Review	ang kine/imp	angular impulse & momentum	** methods, variables to test hypothesis Thought experiments? **If .. then? So what?**
6 9/29	**EXAM 1**	**Project Planning**	Motion Analysis	total body kinetics	** collection plan, analysis plan, time table
7 10/6	Joint level FBD	Muscle contribution to Joint Kinetics	Joint kinetics	**PROJECT COLLECTION**	** Practice the experiment, movements need to be performed in a realistic context
8 10/13	Joint Level Kinetics	**Applications in Rehab engineering**	joint kinetics	**LAB PRACTICAL**	**REVIEW QUANTITATIVE SKILLS MAP out Project Time line within group**
9 10/20	**Applications in Sports Science**	Newton's Laws of Motion, FBD	project: assimilate research literature	joint kinetics	** title, significance, expected results from compare and contrast analysis
10 10/27	Multijoint Kinetics	Multijoint kinetics	project: introduction, methods	project: kinematics	** analyze multijoint control using joint and segment kinematics
11 11/3	Clinical Applications	Review	project: hypothesis (related to each var)	project: impulse/ momentum	** analyze net impulse/change in momentum relationships (lin or ang)
12 11/10	Project analysis	**EXAM 2**	project: results & discussion	project: joint kinetics	**analyze upper extremity or lower extremity joint kinetics
13 11/17	Project discussion	Translation into practice	project: results & discussion	project: interpretation (optional)	** compare results to the literature, data makes sense? What makes quantities big and small? Cause-effect? Significance?
14 11/24	Natural History	***Thanksgiving***	project: discussion	Final report .ppt/prezi	** assimilate results, communicate results
15 12/1	Applications	Review for Final Exam **FINAL: Friday 12/12 2-4 PM**	Project take-home message	**ORAL PROJECT PRESENTATIONS-**	**** 10 min, 5 min questions, hand written FBD/ joint kinetics turned in before, literature .pdf emailed**