University of Southern California – Department of Biological Sciences
HBIO 439L: Human Performance and Bioenergetics
Units: 2 or 4 units
Spring 2015

First meeting is on Wed at 2PM during the first week at school
Subsequent meeting times each week are specific to the student’s project

Students are encouraged to contact the Dr. McNitt-Gray regarding any potential time conflicts and course preparation including prerequisites prior to the start of the semester

Location: PED B9-10 Meeting Location
Instructor: Jill L McNitt-Gray (mcnitt@usc.edu)
Teaching Assistant: Chris Ramos (rchristo@usc.edu)
Office: PED B7-8
Office Hours: Wed 1-2PM

Required Text and Supplies:
Web-Based Lecture Notes, Selected Literature Readings, Electronic Storage Device
Lab Notebook required at all times

Meeting Times: To be determined together by student and professor (4-units: 200 minutes; 2-units: 100 minutes) While class time is formally scheduled for Wed afternoon, the project based nature of this course requires that the meeting times will be specific to the project. Students are encouraged to contact the Dr. McNitt-Gray regarding any potential time conflicts and course preparation including prerequisites.

Evaluation:
Effective application of principles in projects during class (weekly attendance required)
(10%) weekly progress reports using oral, written, and electronic means
(10%) Physiology / Nutrition/ literature review;
(10%) Motor Learning / Motor Control;
(15%) Kinematics of Human Movement;
(15%) Kinetics of Human Movement;
(40%) Comprehensive presentation of work & technical note

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

Objectives: Consistent with the Department of Biological Sciences Learning Objectives
(1) Develop critical thinking and problem solving skills, exploring an interdisciplinary approach within complex human movement to understand cause-effect relationships governing human performance
(2) Gain hands-on experience analyzing human movement, quantifying and interpreting physiological & biomechanical variables of highly skilled individuals and individuals with disabilities or impaired movement patterns.
(3) Improve oral, written, and electronic communication & technical presentation skills
**Course Description**
This course is for students interested in learning more about the cause-effect relationships governing human movement by gaining hands-on experience analyzing the physiological and biomechanical aspects contributing to human performance.

**Exemplar topics** will be related to human performance, motor control, mechanical & physiological energy cost in normal, elite, and clinical populations. For example:

a) *Positive learning transfer* with yoga as a complex motor skill practice complement - impact on movement intention / movement integrity / coordination strategies / metabolic cost / skill performance

b) *Mobility in individuals with and without disability*: Compare and contrast wheelchair propulsion mechanics of paralympians with clinical populations using wheel chairs

c) *Mobility of individuals with and without assistive devices*: Compare and contrast locomotion mechanics of paralympians with clinical populations using assistive devices including prostheses.

d) *Movement mechanics of individuals under physically challenging conditions*: Human performance changes with the onset of physiological fatigue; motor complexity, coordination strategies, altered mechanical loading strategies

**Data Collection Sites:**
USC Kinesiology Laboratories; US Olympic Training Center, Chula Vista, California; Rancho Los Amigos National Rehabilitation Center, Downey, California, StubHub Center, Carson, CA.

**Weekly Topics:** Class activities will emphasize the following aspects

1. **Introduction: Research involving Human Subjects**
   On-line certification process (CITI certification)

2. **Experimental Design and Literature Review**
   Electronic library search and bibliograpy references (Endnote)

3. **Physiology & Nutrition of Human Performance**
   Quantify metabolic aspects of complex motor skill, evaluate performance variables

4. **Kinematic Data - principles & analysis**
   Define mechanical objectives in each phase of task, digitally capture human motion / determine critical performance variables

5. **Motor Learning - Complex Motor Skills**
   Analyze kinematic data in terms of perception-action, determine multi-joint coordination patterns

6. **Kinetic Data - principles & analysis**
   Collect reaction force data, analyze critical performance variables

7. **Present Project Pilot Results (Draft)**
   Develop plan for quantitatively evaluating performance between two conditions

8. **Assimilate results from data collection**
   Develop plan for communicating results of performance evaluation

9. **Physiology/ Motor Control Analysis & Interpretation of results in relation to literature**
   Analyze bioenergetics and motor performance using observed motion

10. **Kinematic data analysis & Interpretation**
    Analyze observed motion (total body / joint / segment levels)

11. **Kinetic data analysis & Interpretation**
Analyze causes of observed motion (total body level analysis)

12. Test hypotheses and present results
   Analyze causes of observed motion (joint level analysis)

13. Write draft of two page abstract
   Prepare experimental design / methods / variables (presentation)

14. Interpret findings in light of the current literature
   Prepare experimental results and discussion (Presentation)

15. Final Presentations with written technical note
   Write 3000 word technical note (J of Biomechanics format)

** course plan may be modified as needed throughout the semester

In addition to in-class contact hours, all courses must also meet a minimum standard for out-of-class time, which accounts for time students spend on homework, readings, writing, and other academic activities. For each unit of in-class contact time, the university expects two hours of out of class student work per week over a semester.

(Please refer to the Contact Hours Reference, located at usc.edu/curriculum/resources.)

Statement on Academic Conduct and Support Systems

Academic Conduct
Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity http://equity.usc.edu/ or to the Department of Public Safety http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems
A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information http://emergency.usc.edu/ will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.