KINESIOLOGY 722  Advances in Biomechanics and Electromyography

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Room & Extension:  IWC 216, x23543

Term TWO (Winter 2011)

Course Description:

This course will survey the biomechanics and electromyography literature from past to present to put recent advances in perspective and provide a solid grounding. Classic landmark studies in link segment modeling, muscle mechanics, and electromyography will provide the basis for developing technologies and current research areas. The myoelectric signal will be examined from its development (physiology) and techniques to monitor changes in force, muscle length, velocity and fatigue.

The course will be seminar based initially driven by the instructor and then led by students. Students will examine original research articles and deliver weekly in class presentations to their peers and lead discussion about the article/area. This will encourage the development of the skills to critically analyze and discuss the literature. Each student's contribution in class is important to the success of the learning experience and they will be evaluated based on these discussions and their contribution to the learning of their peers. Students will deliver two major presentations (20min each) in class during the term on an area germane to the topics being discussed, but something not directly covered in class. Students will be expected to deliver a polished and professional presentation as if they were speaking at a research conference. The weight of the students' second presentation will be greater than the first so that students can incorporate constructive criticism of their first presentation from the instructor and their peer-derived criticisms into their second presentation. Students will also be required to write a major research paper on one the topic, again relevant to the course, but something at arms length from their thesis. Major topic areas include EMG and fatigue, EMG to force processing, muscle mechanics and human movement.

The goals of the goals are to educate students about rudimentary and advanced topics in human biomechanics and electromyography. To develop students' critical appraisal skills in reading primary research articles. To develop student's skills in research-based presentations and scientific writing.

- didactic lectures from instructor, both at beginning of the course
- weekly roundtable presentation and discussion of 5-6 recent research papers
- 12 classes total, including 2 instructor-based lectures

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Resources and Reference Materials:

Readings will be assigned depending on topics covered by student presentations in consultation with the instructor.

1. Muscle - mechanical characteristics
   c. Force-velocity relationship - Hill (1938) - a (long) classic
   d. Series elastic component (SEC) - Bahler (1967) - Quick release

2. EMG - biophysics, recruitment, cross-talk, reproducibility
   a. Milner-Brown, Stein & Yemm (1973) - orderly recruitment
   b. Kadaba et al (1985) - reproducibility of surface and wire EMG
   c. Fuglevand et al (1992) - modelling EMG detection & signals
   d. Solomonow & friends (1994) - cross-talk

3. Presentation topic areas (choose)
   a. EMG vs Contraction velocity
   b. EMG vs Muscle length
   c. EMG vs Force Relationship - linear vs non-linear
   d. EMG-to-Force prediction methods
   e. Fatigue (EMG)
   f. 3D Mechanics Methods
   g. Forward Solutions
   h. Energy, Metabolism & Power
   i. Stretch-Shortening cycle
   j. Efficiency of Movement

Assignments and Grading:

- Class Discussion/Participation - 15%
- Seminar presentations (2) - 20% (1st presentation) - 30% (2nd presentation)
- Final Paper (15 pages max) - 35% (due April 10, 2011)

PLEASE NOTE:

On occasion, it is difficult to predict the direction the course may take and the instructor may need to revise the course outline during term. Students will be informed as early as possible of any changes.

The Department of Kinesiology reserves the right to change dates, deadlines, and/or methods of assessment for this course in the event of unforeseen circumstances, such as illness of the instructor or a labour disruption.
ACADEMIC INTEGRITY

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences (e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript reading “Grade of F assigned for academic dishonesty”, and/or suspension or expulsion from the university). It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at: http://www.mcmaster.ca/univsec/policy/AcademicIntegrity.pdf

The following illustrates only three forms of academic dishonesty:

- Plagiarism (e.g. the submission of work that is not one’s own or for which other credit has been obtained),
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

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