BME 384 – Biomechanics Laboratory

3 Credits, 4 Contact hours
Instructor: Sergei Adamovich, Ph.D.
Course Coordinator: Sergei Adamovich, Ph.D.

Textbook(s)/Materials Required:
N/A

Description:
This laboratory course will expose students to a wide range of quantitative techniques for movement analysis. Students will learn how to use Matlab for data acquisition and analysis. Kinematic analysis will be performed using state of the art equipment with optoelectronic and electromagnetic motion sensors. Movement kinematics will be correlated with the electromyographic activity of the muscles. Analysis of movement kinetics will be performed using strain gauges and force sensors, including force plates for balance control studies. Throughout the course, students will be given the opportunity to observe and ask questions about movement then analyze and evaluate the movement to answer their questions. This process will require the application and integration of anatomical and mechanical concepts to a wide variety of activities. At the conclusion of the course, students will demonstrate basic competence in a systematic approach to the observation, analysis, and evaluation of human movement in clinical, educational, and industrial environments.

Prerequisites:
BME 105, BME 106, BME 301, BME 302 and CS 101

This is a required course for the Biomechanics Track.

Course Learning Outcomes (CLO):
1. Be able to identify the experimental problem in engineering terms, and then state the problem in a hypothesis.
2. Be able to apply the appropriate engineering tools and scientific knowledge to design and conduct an experiment to test the hypothesis
3. Be able to apply appropriate math/engineering analytical methods to present their data and to test the validity of their hypothesis.
4. Be capable of drawing appropriate conclusions from their data analysis.
5. Use the techniques, skills, and modern engineering tools necessary for engineering practice.
6. Be able to apply appropriate statistical tools for describing experimental data and testing hypotheses.
7. Be capable of making measurements on and interpret data from living systems.
8. Be able to address problems associated with the interaction between living and non-living materials and systems.

Student Outcomes:

Student outcome H - Broad education to understand effect of engineering solutions in a global, economic, environmental, and societal context.
Related CLO - 1

Student outcome J - Knowledge of contemporary issues.
Related CLO – 5

Student outcome L - Apply bio/physio insight for BME application
Related CLO – 2,4,7

Student outcome O - Assess safety and effectiveness of interactions between living & non-living.
Related CLO – 5,7,8

Course Topics: The biomechanics of human motion; motion capture: optoelectronic cameras, electromagnetic sensors, force plates; basic muscle physiology: action potential, motor unit and electromyography; Matlab programming: scripting, functions, plotting and animation; signal processing: digital filtering and integration; hypotheses testing: t-test and linear regression.