BAKER COLLEGE
STUDENT LEARNING OUTCOMES

ME 4790 Biomechanics and Biomaterials
3 Semester Hours

Student Learning Outcomes & Enabling Objectives

1. Explain biomechanical analysis of human movement
   a. Discuss the measurement, description, and modeling elements of biomechanical assessment
   b. Explain kinematics, kinetics, anthropometry, muscle mechanics, and electromyography
   c. Explain signal processing methods such as auto- and cross- correlation analysis, frequency analysis, and ensemble averaging
2. Analyze kinematic data and related measuring techniques
   a. Describe direct measurement techniques
   b. Describe imaging measurement techniques
   c. Explain processing of raw kinematic data
   d. Calculate other kinematic variables
3. Analyze anthropometric data and related measuring techniques
   a. Describe density, mass, and inertial properties of the human body
   b. Describe direct experimental measures
   c. Explain muscle anthropometry
4. Analyze forces and moments of force on the human body
   a. Describe biomechanical models including Free-Body Diagrams
   b. Explain force transducers and force plates
   c. Solve problems based on kinetic and kinematic data
5. Analyze mechanical work, energy, and power associated with human movement
   a. Explain the law of conservation of energy
   b. Describe positive and negative work of muscles and muscle mechanical power
   c. Calculate internal and external work
   d. Explain power balances at joints and within segments
6. Analyze three dimensional kinematic and kinetic data
   a. Explain reference systems used in 3D analysis
   b. Determine segment angular velocities and accelerations
   c. Perform kinetic analysis of reaction forces and moments
7. Explain muscle mechanics
   a. Describe different motor units
   b. Explain force-length characteristics of muscles
   c. Explain force-velocity characteristics of muscles

8. Explore kinesiological electromyography
    a. Describe the electrophysiology of muscle contraction
    b. Discuss recording and processing of the electromyogram
    c. Describe the relation between electromyogram and biomechanical variables
9. Analyze biomechanical movement synergies
    a. Explain the support moment synergy
    b. Explain the medial/lateral and anterior/posterior balance in standing
    c. Explain dynamic balance during walking
10. Explore biomaterials and their applications
    a. Explore mechanical, thermal, optical and other properties of biomaterials
    b. Describe applications of biomaterials in medicine and industry

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These SLOs are not approved for experiential credit.

Effective: Fall 2018