

PHYSICAL EDUCATION c165/IB c125L  
Fall Semester 2012  
Instructor: Kathryn Scott [kscotthb@berkeley.edu]  
Introduction to the Biomechanical Analysis of Human Movement  
*Course Outline*

Catalogue Description: Basic biomechanical and anatomical concepts of human movement and their application to fundamental movement patterns, exercise and sport skills.

Prerequisites: Integrative Biology 131 and 131L (Human Anatomy)  
Physical Education 1-5 (activity class sections in selected sports and exercise)  
Basic Physics preferred  
or Consent of the Instructor

Scope of the Course: Examination of the theoretical bases for the understanding and the development of skilled performance in a variety of human movement and athletic activities. Investigation of anatomical and biomechanical principles fundamental to an understanding of human capabilities in selected motor and athletic activities and, especially, of the application of such principles to the improvement of performance.

Units: (4) 3 hours of lecture and 3 hours of laboratory (MWF 10-12am)

Recommended Textbook: Kreigbaum, E. and Barthels, K. BIOMECHANICS A Qualitative Approach for Studying Human Movement, 1996 (fourth edition)

Content:

- A. The skeletal framework
  - (1) Structure
  - (2) Articulations
  - (3) Planes
  - (4) Range of motion
  
- B. The muscular system/muscular action
  - (1) Upper extremity
  - (2) Spinal column and pelvic girdle
  - (3) Lower extremity
  
- C. Factors related to, dependent upon or controlling
  - (1) Center of gravity
  - (2) Base of support
  - (3) Length of lever
  - (4) Application of force
  - (5) Absorption of force
  - (6) Speed of motion
  - (7) Speed of projection
  - (8) Direction
  - (9) Distance
  - (10) Angle of projection
  - (11) Spin and bounce
  - (12) Rebound
  - (13) Effects of air pressure
  - (14) Sequence of joint action
  - (15) Torque
  - (16) Translatory motion
  - (17) Angular motion
  - (18) Center of buoyancy
  - (19) Action/reaction
  - (20) Reduction of resistance
  - (21) Arm supported skills

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- D. Moving and controlling the body under a variety of conditions
  - (1) Walking
  - (2) Running
  - (3) Stopping
  - (4) Changing direction
  - (5) Landing
  - (6) Jumping
  - (7) Balance
  - (8) Posture
  - (9) Aquatic locomotion
  - (10) Rotation free of support
  - (11) Rotation while supported
  
- E. Fundamental manipulative skills
  - (1) Moving external objects (imparting force with the body)
    - (a) accurately
    - (b) over various distances and in various directions
    - (c) of various sizes, shapes, weights, elasticities
    - (d) with various parts of the body
    - (e) with various implements
    - (f) in a variety of patterns
      - (i) underarm
      - (ii) overarm
      - (iii) sidearm
      - (iv) lifting, pushing, pulling
      - (v) adaptations and variations
  
  - (2) Receiving and controlling external objects and receiving the body's own force
    - (a) accurately
    - (b) of various momentums
    - (c) from various distances
    - (d) of various sizes, shapes, weights, elasticities
    - (e) with various parts of the body
    - (f) with various implements
    - (g) landing
  
  - (3) Variations necessitated by the limitation imposed by:
    - (g) objectives of activity
    - (h) implements and equipment
    - (i) strategies and rules of the game
    - (j) surface and area
  
- F. Anatomical concepts related to the performance of physical exercise
  
- G. Exercises for special purposes
  - (1) Increasing range of motion
  - (2) Strength
  - (3) Endurance
  - (4) Posture
  
- H. Analysis of advanced techniques
  - (1) Increasing the complexity of movement, manipulative and controlling techniques, and the resulting biomechanical, kinesiological and strategical adjustments which are involved.
  
  - (2) Development of the ability to differentiate between individual differences which fall within a range indicated by sound movement fundamentals and individual differences which may detract from the development of increasingly successful performances.

Evaluation

- 15% Participation in laboratory activities; 4-6 laboratory papers dealing with the analysis of the performance of selected skills and exercises

Note: Assignments during the laboratory period will be done primarily in groups in which students are encouraged to collaborate and discuss their conclusions. Written assignments may reflect discussions by the group but are to be the original work of each student. Group comments or conclusions should be so stipulated if referenced in the written assignment.

Students are also encouraged to utilize study groups in preparation for the examinations.

- 15% Midterm Examination #1, Wednesday, October 3, 2012
- 20% Midterm Examination #2, Wednesday, November 7, 2012
- 20% Final Project (written analysis of a selected skill), due Monday, Dec. 3, 2012
- 30% Final Examination [\*\*\*Exam Group #1, Monday, December 10<sup>th</sup>, 8:00-11:00am]