

## **COURSE OUTLINE** **Kinesiology / Biomechanics**

### **Course Description**

PE 276. Kinesiology / Biomechanics. 3 hours credit. Prerequisite: Anatomy and Physiology or instructor permission. This course will enable the student to develop a basic understanding of the kinesthetics and mechanics of human motion with respect to performance of sport activities.

### **Course Relevance**

Through the study of anatomical and mechanical principles that govern movement of the joints and muscles, the student will be able to evaluate techniques in sports, fitness, and rehabilitation activities and identify the most efficient method of performing a movement pattern.

### **Required Materials**

Hall, S. J. (2003). Basic Biomechanics. (4th ed.). Boston, MA: McGraw-Hill Companies, Inc.

### **Learning Outcomes**

The intention is for the student to be able to

1. Utilize an understanding of the anatomical and mechanical principles that govern movement in the joints and muscles
2. Evaluate techniques in the mechanics of human movement in sports, fitness, and rehabilitation activities
3. Identify the most efficient method of performing a movement pattern with respect to performance in sport activities

### **Primary Learning PACT Skills that will be DEVELOPED and/or documented in this course:**

Through the student's involvement in this course, he/she will develop his/her ability in the following primary PACT skill areas:

1. Critical Thinking
  - The student will develop critical thinking and analytical skills through identifying the most efficient methods of performing movement patterns in sport activities
2. Problem Solving
  - The student will evaluate differing techniques in the mechanics of sports to identify preferred movement patterns

Secondary skills (developed but not documented):

Health Management  
Historical Interpretation

Writing  
Reading

### **Major Summative Assessment Task**

These learning outcomes and the primary Learning PACT skills will be demonstrated by:

1. Completion of a project consisting of a kinematic breakdown of a fundamental movement demonstrating the application of evaluating techniques in the mechanics of human movement in sport activities and the identification of the most efficient method of performing a movement.

### **Course Content**

- I. Themes – Key recurring concepts that run throughout this course:
  - A. Angular kinetics
  - B. Linear kinetics
- II. Issues – Key issues that will be addressed in this course:
  - A. Newton's laws of motion and human movement / angular motion
  - B. Solving kinetic problems
- III. Concepts – Key concepts that must be understood to address the issues:
  - A. Skeletal considerations for movement
  - B. Muscular considerations for movement
  - C. Neurological considerations for movement
- IV. Skills / Competencies – Actions that are essential to achieve the course outcomes:
  - A. Utilization of movement terminology and analysis
  - B. Understand functional anatomy in regard to various body parts
  - C. Application of force, torque and momentum in movement activities

### **Learning Units**

- I. Basic Movement Terminology
  - A. Movement analysis
  - B. Linear and angular movement
  - C. Kinetics and kinematics
  - D. Planes and axes
  - E. Segments and descriptors
  - F. Segmental movements
- II. Skeletal Considerations for Movement
  - A. Functions of the skeletal system
  - B. Architecture of Bone
  - C. Load Properties
  - D. Types of Joints
  - E. Diarthrodial Joints
- III. Muscular Considerations for Movement
  - A. Gross structure
  - B. Functional characteristics of muscle

- C. Factors influencing muscular force
- D. Strengthening the muscle
- E. Types of resistance training
- F. Injury to the skeletal muscle

#### IV. Neurological Considerations for Movement

- A. Motor Neurons
- B. Types of motor neurons
- C. Action potential
- D. Muscle spindle
- E. Golgi tendon
- F. Flexibility
- G. Plyometric training

#### V. Functional anatomy of upper extremity

- A. Comparison of shoulder and pelvic girdle
- B. Shoulder girdle
- C. Strength and flexibility exercises
- D. Sports movements
- E. Common injuries

#### VI. Functional anatomy of lower extremity

- A. Anatomy of lower extremity
- B. Structure, support and movements
- C. Strength and conditioning of lower extremity
- D. Sports movement
- E. Common injuries of lower extremity

#### VII. Functional Anatomy of the vertebral column

- A. Structure and motion
- B. Combined movements of the pelvis and trunk
- C. Strength and conditioning of the trunk
- D. Contributions of the trunk to sport skills and movement
- E. Sources and Causes of low back pain

#### VIII. Linear Kinematics

- A. Vector and scalar measurement
- B. Velocity and speed
- C. Acceleration
- D. Projectiles

#### IX. Angular Kinematics

- A. Rotation and general motion
- B. Types of angles
- C. Angular motion
- D. Solving kinematic problems

X. Linear Kinetics

- A. Force
- B. Newton's Laws of Motion and human movement
- C. Types of forces
- D. Forces acting on an object

XI. Angular Kinetics

- A. Torque
- B. System of levers
- C. Center of Mass
- D. Newton's Laws of Motion and angular motion
- E. Angular momentum

**Learning Activities**

Independent and collaborative learning activities will be assigned within and outside the college classroom to assist the student in achieving the intended learning outcomes. Class discussion, lectures, audio-visual aids, group activities, reading assignments, a summative assignment task project, laboratory assignments, guest speakers and internet activities will also contribute to the learning process.

**Grade Determination:**

The student will be graded on completion of major assessment task project, class participation, laboratory assignments, examinations, and other methods of evaluation at the discretion of the instructor.