

FMT 235 - BIOMECHANICS

COURSE LEARNING OUTCOMES (CLOs)

1. Describe the kinematics of projectile motion and factors influencing projectile trajectory.
2. Identify, analyze, and solve various biomechanical problems.
3. Demonstrate an understanding of kinetic concepts including inertia, force, torque, and impulse.
4. Identify the major factors involved in the angular kinematics of human movement.
5. Define Newton's laws of physics.
6. Identify the steps involved in finding the center of gravity.

COURSE OUTLINE

- I. Basic structures and terminology
 - A. Anatomy
 - B. Kinesiology terms
- II. Intro to biomechanics
 - A. Problem solving
 - B. lab
- III. Kinematic concepts
 - A. Form of motion
 - B. Terminology
 - C. Special reference systems
 - D. Qualitative analysis
- IV. Kinetics
 - A. Basic concept
 1. Inertia
 2. Mass
 3. Force
 4. COG
 5. Weight
 6. Pressure
 7. Volume
 8. Density
 9. Torque
 10. Impulse
 - B. Mechanical Loads on the Human Body
 - C. Effects of loading
 - D. Assignment: locate three peer reviewed articles which cover any of the basic kinematic concepts
- V. Linear Kinematics of Human Movement
 - A. Linear Kinematic Quantities
 1. Distance and Displacement
 2. Speed and Velocity
 - B. Acceleration
 1. Average and Instantaneous Quantities
 - C. Kinematics of Projectile Motion
 1. Horizontal and Vertical Components
 2. Influence of Gravity
 3. Influence of Air Resistance

- D. Factors Influencing Projectile Trajectory
 - 1. Projection Angle
 - 2. Projection Speed
 - 3. Relative Projection Height
 - 4. Optimum Projection Conditions
- E. Analyzing Projectile Motion
 - 1. Equations of Constant Acceleration
- E. Assignment: locate a journal articles which analysis projectile trajectory and/or motion
- VI. Angular Kinematics of Human Movement
 - A. Observing the Angular Kinematics of Human Movement
 - B. Measuring Angles
 - 1. Relative versus Absolute Angles
 - 2. Tools for Measuring Body Angles
 - 3. Instant Center of Rotation
 - C. Angular Kinematic Relationships
 - 1. Angular Distance and Displacement
 - 2. Angular Speed and Velocity
 - 3. Angular Acceleration
 - 4. Angular Motion Vectors
 - 5. Average versus Instantaneous Angular Quantities
 - D. Relationships Between Linear and Angular Motion
 - 1. Linear and Angular Displacement
 - 2. Linear and Angular Velocity
 - 3. Linear and Angular Acceleration
- VII. Linear Kinetics of Human Movement
 - A. Newton's Laws
 - 1. Law of Inertia
 - 2. Law of Acceleration
 - 3. Law of Reaction
 - 4. Law of Gravitation
 - B. Mechanical Behavior of Bodies in Contact
 - 1. Friction
 - 2. Momentum
 - 3. Impulse
 - 4. Impact
 - C. Work, Power, and Energy Relationships
 - 1. Work
 - 2. Power
 - 3. Energy
 - 4. Conservation of Mechanical Energy
 - 5. Principle of Work and Energy
- VIII. Equilibrium and Human Movement
 - A. Equilibrium
 - 1. Torque
 - 2. Resultant Joint Torques
 - 3. Levers
 - 4. Anatomical Levers
 - 5. Equations of Static Equilibrium

- 6. Equations of Dynamic Equilibrium
 - B. Center of Gravity
 - 1. Locating the Center of Gravity
 - 2. Locating the Human Body Center of Gravity
 - C. Stability and Balance
- IX. Angular Kinetics of Human Movement
- A. Resistance to Angular Acceleration
 - 1. Moment of Inertia