Douglas College

EFFECTIVE: SEPTEMBER 2004
CURRICULUM GUIDELINES

A.	Division:	Science & Technology	Effective Date:	September 2004	
B.	Department / Program Area:	Sport Science	Revision	New Course	X
			If Revision, Section(s) Revised:		
			Date of Previous Revision:		
			Date of Current Revision:	April 5, 2004	

C: SPSC 1151 **D**: Biomechanics **E:** 3

Subject & Course No.	Descriptive Title	Semester Credits

F: Calendar Description:
This course utilizes the application of elementary principles of physics and math to analyze human movement. This analysis also focuses on the development of forces within muscles and their effect on initiating and controlling human movement.

G: Allocation of Contact Hours to Type of Instruction / Learning Settings

Primary Methods of Instructional Delivery and/or Learning Settings:

Lecture/Practice

Number of Contact Hours: (per week / semester for each descriptor)

3 Lectures 1 Lab

Number of Weeks per Semester: 15

H: Course Prerequisites:
Principles of Mathematics 11 or equivalent strongly recommended.

I: Course Corequisites:

None

J: Course for which this Course is a Prerequisite

K: Maximum Class Size:

30

L: PLEASE INDICATE:

	Non-Credit
	College Credit Non-Transfer
X	College Credit Transfer

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bccat.bc.ca)

M: Course Objectives / Learning Outcomes

Upon completion of this course, students will be able to:

1. Describe the science principles that are applicable to the analysis of human movement.
2. Understand and use the concept of a free-body diagram as it applies to human movement.
3. Be able to derive and solve equations of human motion in 2 dimensions.
4. Demonstrate an ability to interpret graphs and simple models which are used to explain human movement.
5. Describe which tools are used to acquire human movement data and show an understanding of their efficacy.
6. Apply knowledge of applied anatomy to describe human movement and motor skills in both anatomical and mechanical terms.
7. Be able to facilitate active learning, critical thinking, and problem solving skills in the qualitative analysis of human movement.

N: Course Content:

1. Qualification of human movement description – Kinematics

   The interrelationship between displacement, velocity and acceleration, both linear and angular, will be used to quantify human movement. Multi-segment motions will be the focus, including running and jumping. Attention to methods of data acquisition and reduction will be important.

   It is expected that students will demonstrate an ability to use vector analysis to solve problems in determining velocities, displacement, and time of travel of object. Specifically, it is expected that students will:

   - Produce and interpret graphs, and determine relationships between kinematic variables in 2D
   - Identify situations involving the use of kinematics and classical mechanics to quantify the kinematics
   - Solve problems involving: displacement, initial velocity, average velocity, acceleration, time

2. Forces that change motion – Kinetics

   Using Newton's Laws, the effect of external forces on human motion will be explored. Impulse and momentum, in linear and angular terms, will be used to explore complex human movements. Examination of data acquisition and reduction will be made and used to acquire data for analysis.

   It is expected that students will analyze forces acting on an object and predict their effects. Specifically, it is expected that students will:

   - Solve problems involving: force, mass, acceleration, friction, coefficient of friction, normal and shear forces, impulse, momentum, angular impulse, angular momentum, moment of inertia
   - Construct free-body diagrams for objects in various situations and use them to solve problems involving balanced or unbalanced forces, objects on inclined surfaces
   - Define work and power, identify where these variables are useful in assessing human motion and solve problems involving: force, displacement, work, power, and efficiency
   - Differentiate between kinetic energy and gravitational potential energy and give examples of each and solve problems involving: rotational and translational kinetic energy, potential energy and spring energy
   - State the law of conservation of momentum and determine whether a collision is elastic or inelastic
   - Analyze conservation of momentum in two dimensions

3. Muscles – generators of force

   This section will deal with identifying the mechanical properties of skeletal muscle, how these properties influence muscle function, and will include the understanding of electromyographical (EMG) technique for recording muscle activation.

It is expected that students will analyze EMG measurable output during selected activities.
Specifically, it is expected that students will:

- Demonstrate an understanding of the elements of the human musculo-skeletal system and how their properties interact during human movement
- Be able to use the concepts of force-length, force-velocity, hysteresis, compression, tension, shear, strain, Young's Modulus, to explain musculo-skeletal adaptation
- Apply knowledge of applied anatomy to describe human movement and motor skills in both anatomical and mechanical terms
- Become familiar with the interaction of the mechanical properties of the musculo-skeletal system as they affect human movement
- Be able to surface electrodes over appropriate anatomical landmarks and record from muscles during a range of human movements
- Use computer programs such as Microsoft Excel to analyze biomechanical data such as joint angle, force, torque, and electromyography
- Become familiar with the conceptual framework for EMG analysis of human movement and understand the physiological and biomechanical basis for recording electrical potentials from striated muscles using surface electrodes

O: Methods of Instruction

Lecture
Discussion group
Audio-visual presentations
Labs – data processing
Critical thinking and problem solving
Work stations
Demonstrations
Individual feedback

P: Textbooks and Materials to be Purchased by Students

Neuromechanics of Human Movement, (Chapters 1, 2, 3, 4) 3rd Edition, R. Enoka, Human Kinetics, 2002

Q: Means of Assessment

Preparation Work and Participation	20%
Quizzes and Problem Solving	10%
Laboratory Reports	20%
Cognitive Midterm Examination	20%
Cognitive Final Examination	30%
TOTAL	100%

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

No

Course Designer(s)

Education Council / Curriculum Committee Representative

Dean / Director

Registrar