SYLLABUS

SUBJECT BIOMECHANICS

TEACHER MSC JERZY KULASA

COURSE DESCRIPTION
This module introduces the student to the anatomical and mechanical bases of physical activity with emphasis on the analysis of sport and exercise skills. This is also introduction to the mechanical principles pertinent to the understanding of human motion
The purpose is to introduce exercise and sport science students to concepts of mechanics as they apply to human movement, particularly those pertaining to exercise, sport, and physical activity. The student should gain an understanding of the mechanical and anatomical principles that govern human motion and develop the ability to link the structure of the human body with its function from a mechanical perspective.

ECTS
4

LEARNING OUTCOMES
At the completion of this course it is desired that each student be able to:

1) describe motion with precise, well-defined mechanical and anatomical terminology;
2) understand and quantify linear and angular characteristics of motion;
3) understand the quantitative relationships between angular and linear motion characteristics of a rotating body;
4) understand and quantify the cause and effect relationship between force and linear and angular motion;
5) understand the mechanics of connective tissue and injury;
6) understand the kinetic and kinematic assessment of posture(s).

GRADING POLICY
Each of our class sessions will be devoted to a combination of lectures, case discussions, class exercises, and group work. Every student is expected to come to class prepared and to actively participate in our learning environment.
Written test (60% of final grade); Class participation (40% of final grade); Attendance will be taken every laboratory meeting. There are no excused absences.

TIMETABLE
Lecture Timetable

	Theme	**Lecture Hours**
1	Bibliography. Programes assumptions. Why Study Biomechanics? • What Is Biomechanics? • What Are the Goals of Exercise and Sport Biomechanics? • The History of Sport Biomechanics • The Organization of Mechanics • Basic Dimensions Used in Mechanics	1

2	Forces: Maintaining Equilibrium or Changing Motion • What Are Forces? • Classifying Forces • Friction • Addition of Forces: Force Composition • Resolution of Forces • Static Equilibrium	2
3	Linear Kinematics: Describing Objects in Linear Motion • Linear Kinematics • Uniform Acceleration and Projectile Motion	2
4	Linear Kinetics: Explaining the Causes of Linear Motion • Newton's First Law of Motion: Law of Inertia • Conservation of Momentum • Newton's Second Law of Motion: Law of Acceleration • Impulse and Momentum • Newton's Third Law of Motion: Law of Action-Reaction • Newton's Law of Universal Gravitation	2
5	Work, Power, and Energy: Explaining the Causes of Motion Without Newton • Work • Energy • The Work-Energy Relationship • Power	2
6	Torques and Moments of Force: Maintaining Equilibrium or Changing Angular Motion • What Are Torques? • Forces and Torques in Equilibrium • What Is Center of Gravity?	2
7	Angular Kinematics: Describing Objects in Angular Motion • Angular Position and Displacement • Angular and Linear Displacement • Angular Velocity • Angular and Linear Velocity • Angular Acceleration • Angular and Linear Acceleration	2
8	Angular Kinetics: Explaining the Causes of Angular Motion • Angular Inertia • Angular Momentum • Angular Interpretation of Newton's First Law of Motion • Angular Interpretation of Newton's Second Law of Motion • Angular Impulse and Angular Momentum • Angular Interpretation of Newton's Third Law of Motion	2
	Final Exam	1

Class Timetable

	Theme	**Class Hours**
1	Forces: Maintaining Equilibrium or Changing Motion Review Questions & Problems	2

2	Linear Kinematics: Describing Objects in Linear Motion Review Questions & Problems	2
3	Linear Kinetics: Explaining the Causes of Linear Motion Review Questions & Problems	2
4	Work, Power, and Energy: Explaining the Causes of Motion Without Newton Review Questions & Problems	2
5	Torques and Moments of Force: Maintaining Equilibrium or Changing Angular Motion Review Questions & Problems	2
6	Angular Kinematics: Describing Objects in Angular Motion Review Questions & Problems	2
7	Angular Kinetics: Explaining the Causes of Angular Motion Review Questions & Problems	2
	Class Test	1

TEXTBOOK AND REQUIRED MATERIALS

McGinnis, Peter M.: Biomechanics of Sport and Exercise-2nd Edition.
Robertson, D. Gordon E.: Research Methods in Biomechanics.
Zatsiorsky, Vladimir: Kinetics of Human Motion.
Zatsiorsky, Vladimir: Kinematics of Human Motion.
Whiting, William C.: Biomechanics of Musculoskeletal Injury

PREREQUISITES:

Secondary school course in math and physics.