

**Subject: Biomechanics****I. General information**

Organization unit	Faculty of Physical Education Chair: Biomedical sciences Subject: Biomechanics Supervisor: phd Dagmara Iwańska
Course name	Biomechanics
Subject code	15/2/I/PE
Teaching language	English
Type of subject (obligatory/ facultative)	obligatory
Level of studies (eg. bachelor, master)	bachelor
Study year	2
Semester	3
ECTS points	4
Teacher/e-mail	M.A. Anna Mazurkiewicz anna.mazurkiewicz@awf.edu.pl
Studies program in which the subject is realized	Biomechanics
Method of realization (stationary/ distance learning)	Stationary
Prerequisites	Anatomy, biology, biochemistry, physiology

II. Detailed Information**Course aims and objectives**

A1	Knowledge and skills connected with understanding the causes and results of forces in human body movement
A2	Knowledge about structural, geometric , informational and energy-related parameters of human body movement abilities
A3	Ability to perform selected biomechanical measurements (maximum Torque of selected group of muscles in static conditions , ground reaction force)

Learning outcomes

Learning outcome	Subject's learning outcomes
Knowledge	
<p>K_W01 Familiarity and comprehension of the basics of functioning of human organism with the focus on the movement mechanics and the movement organs and the basic physiological and biochemical processes occurring in the organism of a sportsperson.</p> <p>K_W12 Familiarity with basic physical education terminology, comprehension of its sources and implementation within other associated disciplines (sport, tourism, movement recreation, health and aesthetic behaviour)</p>	<ul style="list-style-type: none"> • Knowledge about basics of mechanics • Knowledge about basic statements of biomechanics
<p>K_W01 Familiarity and comprehension of the basics of functioning of human organism with the focus on the movement mechanics and the movement organs and the basic physiological and biochemical processes occurring in the organism of a sportsperson.</p> <p>K_W02 Familiarity and comprehension of the place of a human being in the universe as a biological and social being. Knows and understands the influence of social, economic and environmental factors as modifiers of physical activity and physical development in ontogenesis. Familiarity with basic methods and measurement techniques aimed at helping the assessment of basic components in the scope of physical fitness and activity.</p> <p>K_W03 Familiarity and comprehension of basic functions of the body including those that may occur during physical effort as well as negative and positive effects of physical activity. Comprehension of problems connected with biological recuperation and the process of physical renewal.</p>	<ul style="list-style-type: none"> • Knowledge about practical application of biomechanics in physical education and sports
<p>K_W01 Familiarity and comprehension of the basics of functioning of human organism with the focus on the movement mechanics and the movement organs and the basic physiological and biochemical processes occurring in the organism of a sportsperson.</p> <p>K_W03 Familiarity and comprehension of basic functions of the body including those that may occur during physical effort as well as negative and positive effects of physical activity. Comprehension of problems connected with biological recuperation and the process of physical renewal.</p>	<ul style="list-style-type: none"> • Knowledge about Structural, geometric , informational and energy-related parameters of human body movement abilities
<p>K_W01 Familiarity and comprehension of the basics of functioning of human organism with the focus on the movement mechanics and the movement organs and the basic physiological and biochemical processes occurring in the organism of a sportsperson.</p> <p>K_W08 Familiarity with the course and importance of impact of diverse forces on the motor system during movement activity. Comprehension of the meaning of neuromuscular coordination</p>	<ul style="list-style-type: none"> • Knowledge about relations between outside and inside forces in human body • Basic knowledge about static and dynamic type of muscles work

in the process of movement learning.	
Skills	
K_U02 Ability to use the basic measurement methods and techniques to evaluate the structure and development of a human being and to evaluate the basic components of children's and teenager's fitness.	<ul style="list-style-type: none"> • Ability to apply basic mechanic formulas to evaluate kinematics and dynamics of motion in various sport disciplines
<p>K_U02 Ability to use the basic measurement methods and techniques to evaluate the structure and development of a human being and to evaluate the basic components of children's and teenager's fitness.</p> <p>K_U03 Ability to interpret reactions of the organism for effort in different age groups. Ability to implement the basic rules of health training. Ability to evaluate the level of tiredness and to plan class breaks and other forms of physical activity of a health nature or related to recreation and manage the development of effort adaptation. Ability to explain and interpret metabolic changes taking place after the effort of different intensities with the use of varied biochemical measurement parameters.</p> <p>K_U07 Ability to implement in practice biochemical knowledge to be able to practice sports safely.</p> <p>K_U11 Ability to use the basic theoretical knowledge associated with sport and related disciplines to analyse and evaluate educational effects and problems (education and physical education) as well as diagnose and design practical activities.</p>	<ul style="list-style-type: none"> • Ability to conduct measurement of the maximum Torque of selected groups of muscles on static conditions • Ability to conduct measurement of the ground reaction force countermovement vertical jump, count maximum height of displacement the center of body mass and interpret changes of ground reaction force from the chart • Ability of practical application of those skills in training
Social Competences	
K_K05 Developing and advancing knowledge and skills in an individual way.	<ul style="list-style-type: none"> • Understands the practical application of mechanics in analysis of human body movement and the constant need of improvement in that area
<p>K_K02 Reaching assigned objectives and tasks, planning and implementing educational activities in different social environments individually as well as in a team.</p> <p>K_K05 Developing and advancing knowledge and skills in an individual way.</p>	<ul style="list-style-type: none"> • Has the necessary abilities to conduct basic biomechanics measurements and understands it's necessity and practical application in sport. • Has the abilities to conduct control measurement of basic physical abilities with compliance to safety rules.
K_K02 Reaching assigned objectives and tasks, planning and implementing educational activities in different social environments individually as well as in a team.	<ul style="list-style-type: none"> • Shows self-sufficiency and initiative to create and modify new measurement or control methods in a field of developing physical activity habits and proper and safe movement technique

Explanations of symbols:

- ¹**K** - field-related learning effects
- W** - (after underscore) knowledge category
- U** - (after underscore) skills category
- K** - (after underscore) social competencies

Syllabus contents

No	Title
Classes/ Practical classes	
1-2	Introduction to biomechanics Practical application of biomechanics in science, sport and physical education
3-4	Structural, geometric , informational and energy-related parameters of human body movement abilities
5-14	Fundamental concepts of mechanics in physics in: the statics, dynamics and kinematics and its practical application in sport and sport science
15-20	Measurement of maximum torque of selected muscle group in static condition
21-26	Measurement of ground reaction force in countermovement jump. Theoretical and practical classes.
27-30	General concept of metrology and rules and methods of data analysis. Theoretical and practical classes.

1 ECTS point = 30 hours students work (contact + self study)

TYPES OF CLASSES	HOURS
Contact hours	30
Self study	90
Total = 120 hours = 4 ECTS	

Assessment criterion:

The assessment model is composed 4 criteria:

- theoretical evaluation (writing test/exam)
- analysis of measured data
- personal engagement
- proper conducting of measurements

Each criteria is marked from 2 to 5. Mark 2 means that student did not evaluate properly in this criteria. In order to evaluate student has to achieve at least mark 3 in each criteria.

Obligatory literature: R. Enoka, *Neuromechanics of Human Movement*, wyd. 5, 2008