Subject: Biomechanics-motion measurement methods

General information

Organization unit	Faculty of Physical Education Chair: Biomedical sciences Supervisor: phd Dagmara Iwańska
Course name	Biomechanics-motion measurement methods
Subject code	WFII-21
Teaching language	English
Type of subject (obligatory/ facultative)	obligatory
Level of studies (eg. bachelor, master)	Master
Study year	1
Semester	2
ECTS points	4
Teacher/ e-mail	M.A. Anna Mazurkiewicz anna.mazurkiewicz@awf.edu.pl
Studies program in which the subject is realized	PHYSICAL EDUCATION
Method of realization (stationary/ distance learning)	STATIONARY
Prerequisites	Anatomy, biology, biochemistry, physiology , Biomechanics I, mathematics (high school level), good computer skills, abilities of using Excel program

Detailed Information

Course aims and objectives

A1	Introducing the knowledge and abilities to analyze models of variety type of human movement
A2	Biomechanical analysis of forces acting of the human body during different type of movements. Recognition of different ways of examination and analysis the movement technique depending on sport discipline

A3	Analysis of training load components and ways of selecting them in construction of training program. The practical application of supercompensation phase in training. The use of mathematical modelling in sport and human movement science.
A4	Examination and analysis of human body dynamic work abilities in laboratory conditions

Learning outcomes

Learning outcome	Subject's learning outcomes
Knowledge	
K_W03 Knows objectives and functions of sport sciences - subjects and methods. Knows and understands basic principles of logic, principles of scientific research, research workflows and basic methods, techniques and research tools. Understands the sampling method. Knows the rules of writing a research paper and ethical principles applicable in research.	Knowledge about basics of mechanics of the human body
K_W03 Knows objectives and functions of sport sciences - subjects and methods. Knows and understands basic principles of logic, principles of scientific research, research workflows and basic methods, techniques and research tools. Understands the sampling method. Knows the rules of writing a research paper and ethical principles applicable in research. **K_W10** Familiarity with application of different levels of physical effort and environmental conditions in the development of adaptation and physical fitness of people at different ages and with different physical performance.	Knowledge about stabilization of human body and characteristics of human boy posture
K_W03 Knows objectives and functions of sport sciences - subjects and methods. Knows and understands basic principles of logic, principles of scientific research, research workflows and basic methods, techniques and research tools. Understands the sampling method. Knows the rules of writing a research paper and ethical principles applicable in research. **K_W07** Knows basic statistical methods, principles of quantitative data processing and ways of is deployment in scientific work. Recognises and understands the principles of formulation and verification of statistical hypotheses and understands all aspects comprised by statistical analysis. **K_W10** Familiarity with application of different levels of physical effort and environmental conditions in the development of adaptation and physical fitness of people at different ages and with different physical performance. **K_W11** Knows the rules of programming and planning of sport and health training in various stages of ontogenesis.	Knowledge about different ways of measurement of training load and characteristics of training load components in selected of types of training
K_W03 Knows objectives and functions of sport sciences - subjects and methods. Knows and understands basic principles of logic, principles of scientific research, research workflows and basic methods, techniques and research tools. Understands the sampling method. Knows the rules of writing a research paper and ethical principles applicable in research. **K_W10** Familiarity with application of different levels of physical	Knowledge about criteria of examination and analysis of selected types of movement (during :athletic jumps and throws, swimming; rotational movement, walking, running)

effort and environmental conditions in the development of adaptation and physical fitness of people at different ages and with different physical performance.	
K_W03 Knows objectives and functions of sport sciences - subjects and methods. Knows and understands basic principles of logic, principles of scientific research, research workflows and basic methods, techniques and research tools. Understands the sampling method. Knows the rules of writing a research paper and ethical principles applicable in research.	Knowledge about mathematical modelling in sport and human movement science
Skills	
K_U01 Ability to assess causes of changes that take place in the human body as a result of adopted lifestyles and to recognize dangers for natural environment resulting from human activities. **K_U06** Ability to evaluate the accuracy of selected exercise and effort programs depending on the age and physical fitness of people exercising. **K_U08** Ability to make use of basic statistical methods for needs of research work. Ability to compile, describe and analyse quantitative and qualitative data and to interpret the obtained results. Ability to formulate substantive conclusions based on statistical conclusions.	The ability to use law of mechanics and physics to analyze the kinematics and dynamics of movement in different sport disciplines
K_U01 Ability to assess causes of changes that take place in the human body as a result of adopted lifestyles and to recognize dangers for natural environment resulting from human activities. **K_U06** Ability to evaluate the accuracy of selected exercise and effort programs depending on the age and physical fitness of people exercising.	The ability to calculate the mechanical parameters of the effectiveness of the motion technique based on cinematographic methods.
K_U01 Ability to assess causes of changes that take place in the human body as a result of adopted lifestyles and to recognize dangers for natural environment resulting from human activities. **K_U03** Ability to formulate and solve research problems in the context of physical culture sciences. Ability to use basic methods of research and to use research tools available, as well as to evaluate accepted research procedures and to interpret results achieved. **K_U06** Ability to evaluate the accuracy of selected exercise and effort programs depending on the age and physical fitness of people exercising. **K_U08** Ability to make use of basic statistical methods for needs of research work. Ability to compile, describe and analyse quantitative and qualitative data and to interpret the obtained results. Ability to formulate substantive conclusions based on statistical conclusions.	The ability to use measuring systems to examine the lower limbs maximum power and changes power in time frame The ability to assess the velocity of movement as a function of variable external load for lower limb muscles.
Social Competences	
K_K02 Involvement in creative problem solving, planning and execution of educational activities in different social environments	Understands the practical application of mechanics in

independently and in a team.	analysis of human body movement and the constant need of improvement in that area
K_K02 Involvement in creative problem solving, planning and execution of educational activities in different social environments independently and in a team.	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 Involvement in creative problem solving, planning and execution of educational activities in different social environments independently and in a team. **K_K10** Ability of independent and critical complementing of own knowledge and skills. Use of interdisciplinary approach to the field of specialisation during the execution of assigned tasks.	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	
SC1-2	Repetitorium of physics with a special consideration of dynamics. Solving assignments.
SC3-4	Description of rules related to conducting research using motion capture analysis. Criteria of movement analysis, assessment of body movement technique based on motion capture method. Calculation of mechanical parameters based on camera recorded movement.
SC5-6	Criteria of movement analysis, assessment of the effectiveness of body movement technique in selected physical exercises based on motion capture method
SC7-8	Relations between physical activity load and speed of movement. Hill' curve model.
SC9-10	Acquainting with devices for measuring velocity of movement in the function of variable load. Conducting the measurement. Calculation of variables, analysis and interpretation of obtained results.
SC11-12	The theoretical basis for assessing endurance based on changes of lower limbs power in the function of time during exercise performed on the incline training machine.
SC13-14	Conductin a measurement on the incline training machine. Calculation of the power loss factor as a function of time, analysis and interpretation of obtained results.
SC15	Exam. Final Evaluation.

1ECTS 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