#### **CLASS CARD**

# PHYSIOLOGY OF PHYSICAL EFFORT

Basic classes	Code in the study plan	ECTS
Physiology of Physical Effort	21/1/II/PE	4

Education profile	General academic
Faculty and field of study	Faculty of Physical Education
Studies program in which the	21/1/II/PE
subject is realized	
Professor's name	dr hab. Piotr Żmijewski, prof. AWF
Level of studies (eg. bachelor,	Master
master)	
Study year and semester	1 year, 2 semester
Language	English
Method of realization	Stationary
(stationary/ distance learning)	
Lectures/classes hours	Lectures
Form of passing classes	Exam
Type of subject	Obligatory
(obligatory/ facultative)	
Prerequisites	Basic knowledge of human physiology, anatomy
	and biochemistry

## **DETAILED INFORMATION**

# Course aims and objectives

A1	To provide students with a theoretical foundation in the fundamental
	mechanisms governing the functioning of human body systems.
A2	To develop an understanding of how individual cells and organs interact to
	influence overall body function.
A3	To equip students with knowledge of the basic mechanisms that maintain
	physiological homeostasis.
A4	To introduce students to key physiological measurements and methods
	used to assess body function.

# LEARNING OUTCOMES IN KNOWLEDGE, SKILLS AND SOCIAL COMPETENCES FOR CLASSES

Learning outcome	Subject's learning outcomes	
Knowledge		
K_W01	Has knowledge and understanding of advanced terminology, concepts,	
	theories, and methods used in exercise physiology	
K_W03	Has knowledge and understanding of the influence of environmental	
	factors on physiological responses, physical activity, and its outcomes	

K_W08	Has knowledge and understanding of the methods and measurement
	techniques used in exercise physiology
	Skills
K_U01	Is able to identify and describe the main functional systems of the human body
	and explain the interactions between them.
K_U03	The student can independently formulate and solve research problems within
	the scope of exercise physiology. The student is capable of selecting and
	applying appropriate research methods and tools in practical and experimental
	settings.
	Social Competences
K_K01	The student respects and adheres to safety principles and protocols during
	exercise testing and physiological assessments.

# SUBJECT PROGRAM CONTENT DIVISION BY FORMS OF IMPLEMENTATION

FORM OF CLASSES – LECTURE - subject		Reference to subject- specific learning
		outcomes
L1-2	Classifications of physical exercises.	K_W01, K_W08
L3-4	Skeletal muscle: structure and function.	K_W01, K_U01
L5-6	Nervous control of muscular movement.	K_W01
L7-8	Pulmonary responses to exercise.	K_U01
L9-10	Cardiovascular responses to exercise.	K_W03, K_U01
L11-12	Bioenergetics - Energy sources.	K_W01
L13-16	Measurement of energy expenditure.	K_U03, K_K01
L17-20	Physical capacity.	K_W01
L21-22	Direct measurement of maximum oxygen uptake.	K_W01, K_K01
L23-24	Indirect methods of evaluation of aerobic capacity.	K_W01, K_K01
L25-26	Physiological effects of physical training.	K_W03
L27-28	Classifications of physical exercises and training	K_W03, K_W08, K_K01
L29-30	Independent execution of analytical tasks	K_W01, K_U01, K_K01

# PLANNED METHODS/FORMS/TEACHING MEANS

Program content	Teaching methods/forms
L1-28	Lecture with multimedia presentation
L29-30	Independent task completion
L27-28 Problem-solving and analysis	
Teaching resources: Computer, Multimedia projector, Thematic presentations	

# METHODS OF VERIFYING THE EXPECTED LEARNING OUTCOMES ACHIEVED BY THE STUDENT

Learning outcomes for classes	Assessment methods
K_W01, K_W03, K_W08, K_U01, K_U03,	Competency test
K_K01	

## CONDITIONS FOR PASSING CLASSES:

The completion of all outstanding work resulting from absence from classes is mandatory. Missed content must be made up by preparing a summary or presentation covering the topics discussed during the missed classes.

The final grade is based on an assessment of knowledge and skills.

## SAMPLE ASSESSMENT/EXAMINATION TOPICS

- 1. Describe the main classifications of physical exercises and provide examples for each category.
- 2. Compare and contrast aerobic and anaerobic exercises in terms of physiological demands and outcomes.
- 3. Explain the structure of skeletal muscle, including its microscopic anatomy.
- 4. Describe the process of muscle contraction according to the sliding filament theory.
- 5. Discuss the differences between slow-twitch and fast-twitch muscle fibers in terms of structure and function.
- 6. Explain the function of motor units and how motor unit recruitment affects muscle force.
- 7. Explain how ventilation changes during the different phases of exercise.
- 8. Describe the physiological mechanisms that regulate breathing during physical activity.
- 9. Discuss how exercise intensity affects tidal volume and respiratory rate.
- 10. Describe how heart rate, stroke volume, and cardiac output change during exercise.
- 11. What is the role of the autonomic nervous system in cardiovascular regulation during exercise?
- 12. Outline the main energy systems used during exercise and the duration and intensity ranges at which each predominates.
- 13. Compare the ATP-PCr system, glycolysis, and oxidative phosphorylation in terms of energy yield and speed.
- 14. How does substrate utilization differ during low- vs. high-intensity exercise?
- 15. Describe direct and indirect calorimetry methods used to measure energy expenditure.
- 16. Explain the concept of METs and their application in estimating energy cost.
- 17. What are the limitations of different methods of energy expenditure measurement?
- 18. Define physical capacity and describe the components that determine it.
- 19. Discuss the factors influencing individual differences in physical capacity.
- 20. How can physical capacity be assessed in laboratory and field conditions?
- 21. Describe the protocol and physiological basis of a  $\rm VO_2max$  test.
- 22. What criteria are used to determine whether VO<sub>2</sub>max has been achieved?

- 23. Discuss the strengths and limitations of direct  $VO_2max$  measurement.
- 24. Compare and contrast field tests and submaximal laboratory tests for estimating aerobic capacity.
- 25. Describe at least two indirect methods for evaluating  $VO_2$ max and explain their assumptions.
- 26. What factors may influence the accuracy of indirect aerobic capacity tests?
- 27. Explain the cardiovascular adaptations resulting from endurance training.
- 28. Describe the muscular and metabolic changes induced by regular strength training.
- 29. How do training adaptations differ between aerobic and anaerobic exercise programs?
- 30. Describe the major cardiovascular and muscular adaptations resulting from regular exercise training.

## **ENGLISH BIBLIOGRAPHY**

Basic	Kenney, W. L., Wilmore, J. H., & Costill, D. L. (2023). <i>Physiology of sport and exercise</i> (8th ed.). Human Kinetics.
Additional	McArdle, W. D., Katch, F. I., & Katch, V. L. (2022). Exercise physiology: Nutrition, energy, and human performance (9th ed.). Wolters Kluwer.

#### **SELF STUDY**

Full-time studies		
Number of hours to complete the activity	ECTS	Type of activity
30	1	Classes requiring the direct participation of academic teachers
90	3	Other forms of classes/education for achieving the intended learning outcomes (total)

# Number of ECTS points that a student obtains in classes developing practical skills: 2

Author of the class card:	Name, surname and email
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