SYLLABUS – DOCTORAL SCHOOL
CYCLE OF EDUCATION 2022TO 2026

BASIC INFORMATION CONCERNING THIS SUBJECT	
Subject title	**Doctoral workshop**
Name of the unit realizing the subject	Doctoral School at the University of Rzeszów
Subject type (compulsory, optional)	compulsory
Year/Semester	I-IV, sem. I-VIII
Discipline	Physical Culture Sciences
Language of lecture	Polish
Name and surname of the course coordinator	Dr Krzysztof Przednowek, Professor at the University of Rzeszów
Name and surname of the course instructor	Dr Krzysztof Przednowek, Professor at the University of Rzeszów
Prerequisites	In-depth knowledge, skills and social competences in the field of physical culture sciences, acquired during first and second cycle studies. Knowledge of scientific research methodology applied in physical culture sciences.

ABSTRACT OF THE SUBJECT

(synthetic description of the content and objectives of the subject; 100-200 words)

Subject: Doctoral studies, or in other words, a specialised subject, is a subject during which doctoral students' research skills are perfected. The subject will present modern technologies for diagnosing motor and psychomotor abilities and assessing the structure and composition of the human body. While working in laboratories, doctoral students will become familiar with research protocols and the practical aspects of conducting research in physical culture sciences. In particular, methods of motion analysis using motion capture systems, platforms for measuring ground reaction forces, dynamometric systems and surface electromyography will be presented and mastered. In addition, as part of the course, doctoral students will become familiar with computer software that supports the research work of scientists.

METHODS OF VERIFICATION OF LEARNING OUTCOMES

Symbol of effect	Expected learning outcomes efekty	Reference to learning outcomes for qualifications at PRK level 8 (symbol) (symbol)	Form of didactic classes	Verification methods (e.g., colloquium, oral exam, written exam, project, etc.)
Knowledge No.	**Knows and understands**			
1	To an extent that allows for the revision of existing paradigms, they have in-depth knowledge of global scientific achievements, including theoretical foundations, general issues, and selected specific issues of research interest in the scientific discipline of physical culture studies.	P8S_WG1	Seminar	project

2	Has knowledge of the directions of development and current scientific achievements — both national and global — in the field of physical culture sciences, with particular emphasis on research on technical elements in tennis and related disciplines.	P8S_WG2	Seminar	project
3	She is thoroughly familiar with the conceptual framework used in sport, particularly in tennis, including in a foreign language that is her primary language.	P8S_WG3	Seminar	project
4	She is familiar with scientific research methodology, including the principles of research planning and implementation using interdisciplinary techniques and research tools in the discipline of physical culture, with particular emphasis on the research methodology used in tennis.	P8S_WG4	Seminar	project
Skills No.	**She is able to**			
1	Use interdisciplinary knowledge to creatively identify and innovatively solve complex scientific problems related to serving techniques in tennis or perform research tasks, in particular: define the purpose and subject of scientific research, formulate a research hypothesis, develop research methods, techniques and tools and apply them creatively, and draw conclusions based on the results of scientific research.	P8S_UW1	Seminar	project
2	Use available scientific literature to identify and solve research problems related to tennis, and take actions related to innovative activities to create new elements of existing achievements.	P8S_UW2	Seminar	project
3	Critically analyse and evaluate the results of scientific research, expert activities and other creative work, as well as their contribution to the development of knowledge.	P8S_UW3	Seminar	project

Social competence No.	Is ready to			
1	Critically evaluate existing achievements related to tennis serving techniques within the scientific discipline of physical culture.	P8S_KK1	Seminar	project

FORMS OF TEACHING CLASSES, HOURS AND CREDITS1

Semester (No.)	Lecture	Exercise	Laboratory	Practical	Other	**Number of point ECTS**
I	-	-	-	-	Seminar -30 hrs.	3
II	-	-	-	-	Seminar -30 hrs.	3
III	-	-	-	-	Seminar -30 hrs.	3
IV	-	-	-	-	Seminar -30 hrs.	3
V	-	-	-	-	Seminar -30 hrs.	3
VI	-	-	-	-	Seminar -30 hrs.	3
VII	-	-	-	-	Seminar -30 hrs.	3
VIII	-	-	-	-	Seminar -30 hrs.	3
total:					8 x 30 hrs. – 240 hrs.	**24**

TEACHING METHODS

1. Analysis and interpretation of scientific sources, including discussion.
2. Multimedia presentations.
3. Participation in laboratory research.
4. Statistical analysis of research results.
5. Creation and discussion of research reports.

PROGRAM CONTENT

Contents covered throughout the entire course (semesters I to VIII):

1. Introduction to research methods used in physical culture studies.
2. Advanced and basic research protocols in the assessment of movement technique using inertial and optical motion capture systems.
3. Advanced and basic research protocols using ground reaction force platforms.
4. The use of surface electromyography and tensomyography in physical culture sciences.
5. The use of cognitive assessment systems in physical culture sciences.
6. The use of ergospirometric systems in performance testing.
7. The use of GPS sensors in the assessment of training units in team sports.
8. The use of accelerometric systems in the assessment of physical activity.
9. The use of dynamometric systems in the assessment of strength abilities.
10. Methods of assessing body composition and structure using bioimpedance and plethysmography.
11. Creation and interpretation of measurement protocols for multi-module biomechanical assessment systems.
12. Techniques for preparing and processing data, including database construction, statistical analysis and introduction to machine learning algorithms.
13. Computer modelling in physical culture sciences, including the issue of sports prediction.
14. Familiarisation with computer systems supporting the researcher's work (including JabRef, Statistica, the R environment and the Latex language).

CONDITIONS FOR COMPLETING THE SUBJECT (EVALUATION CRITERIA)

Passing grade after each semester, possible semester grades are: 2.0, 3.0, 3.5, 4.0, 4.5, 5.0.

After each semester, doctoral students submit a project. The grade is determined based on the total number of points obtained from the project:

- up to 50% of points – ndst. (2.0)
- 51–60% of max. points – dst (3.0)
- 61–70% of max. points – dst plus (3.5)
- 71–80% max. points – good (4.0)
- 81–90% max. points – good plus (4.5)
- 91–100% max. points – very good (5.0)

TOTAL STUDENT WORKLOAD REQUIRED TO ACHIVE THE DESIRED RESULT IN HOURS AND ECTS CREDITS

Activity	The average number of hours to complete the activity
Hours carried out in direct contact resulting from the study plan	**240 hrs. – 8 x 30 hrs.**
Others with the participation of the teacher (participation in consultations, exam)	**50**
Hours carried out independently by the PhD student (preparation for classes, exam, writing a paper, etc.)	**430 hrs.**
TOTAL HOURS	**720 hrs.**
TOTAL NUMBER OF ECTS CREDITS	**24**

LITERATURE

Primary literature:

1. Kusy K., Zieliński J.: Diagnostyka w sporcie, podręcznik nowoczesnego trenera. Wydawnictwo AWF Poznań, 2018.
2. Sozański H., Sadowski J., Czerwiński J.: Podstawy teorii i technologii treningu sportowego tom 1 i 2. Wydawnictwo AWF Warszawa, 2015.
3. Berbeka J., Lipecki K.: Aktywność fizyczna z wykorzystaniem technologii informacyjno-komunikacyjnych. Difin, 2019.
4. Anguera, M. T., & Hernández Mendo, A. 2013. Observational methodology in sport sciences.
5. Ryguła I. 2003, Proces badawczy w naukach o sporcie. AWF Katowice, Katowice.

Supplementary literature:

1. Baerg, A. (2022). Quantification, Big Data, and Biometrics in Sport. In *Sport, Social Media, and Digital Technology*. Emerald Publishing Limited.
2. Clark, J., & Nash, C. (2021). Big data in sport. In *Practical Sports Coaching* (pp. 201-211). Routledge.
3. Baca, A. (Ed.). (2014). *Computer science in sport: research and practice*. Routledge.
4. Ortega, B. P., & Olmedo, J. M. J. (2017). Application of motion capture technology for sport performance analysis. *Retos: nuevas tendencias en educación física, deporte y recreación*, (32), 241-247.
5. Fuss, F. K., Subic, A., & Mehta, R. (2008). The impact of technology on sport—new frontiers. *Sports Technology*, *1*(1), 1-2.
6. Omoregie, P. O. (2016). The Impact of technology on sport performance. In *Proceedings of INCEDI 2016 Conference*.
7. Beckham, G., Suchomel, T., & Mizuguchi, S. (2014). Force plate use in performance monitoring and sport science testing. *New Studies in Athletics*, *29*(3), 25-37.
8. Camomilla, V., Bergamini, E., Fantozzi, S., & Vannozzi, G. (2018). Trends supporting the in-field use of wearable inertial sensors for sport performance evaluation: A systematic review. *Sensors*, *18*(3), 873.
9. Taborri, J., Keogh, J., Kos, A., Santuz, A., Umek, A., Urbanczyk, C., ... & Rossi, S. (2020). Sport biomechanics applications using inertial, force, and EMG sensors: A literature overview. *Applied bionics and biomechanics*, *2020*.
10. Krzeszowski, T., Przednowek, K., Wiktorowicz, K., & Iskra, J. (2016). Estimation of hurdle clearance parameters using a monocular human motion tracking method. *Computer Methods in Biomechanics and Biomedical Engineering*, *19*(12), 1319-1329.

	11. Scott, M. T., Scott, T. J., & Kelly, V. G. (2016). The validity and reliability of global positioning systems in team sport: a brief review. *The Journal of Strength & Conditioning Research*, *30*(5), 1470-1490.

***(1 ECTS POINT CORRESPONDS TO 25–30 HOURS OF TOTAL WORK BY THE DOCTORAL STUDENT NECESSARY TO ACHIEVE THE INTENDED RESULTS)**

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DATE AND SIGNATURE OF THE COURSE LECTURER

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APPROVAL OF THE HEAD OF THE UNIT OR AUTHORISED PERSON