

A COURSE SYLLABUS – DOCTORAL SCHOOL
REGARDING THE QUALIFICATION CYCLE FROM 2025/2026 TO 2028/2029

GENERAL INFORMATION ABOUT COURSE				
Course title	DOCTORAL SEMINAR			
Name of the unit running the course	Rzeszów University Doctoral School			
Type of course (<i>obligatory, optional</i>)	compulsory subject			
Year and semester of studies	years I-IV, semesters: I-VII			
Discipline	Technical informatics and telecommunications			
Language of Course	Polish language/English language			
Name of Course coordinator	Barbara Pękala			
Name of Course instructor	Barbara Pękala			
Prerequisites	Academic education at the Master's level. Knowledge, skills, and social competences at level 7 of the Polish Qualifications Framework. Foreign language proficiency at level B2.			
BRIEF DESCRIPTION OF COURSE (100-200 words)				
<p>The doctoral seminar is devoted to methods using interval statistics in feature significance assessment and The goal of the doctoral seminar is to develop doctoral students' research competencies in technical computer science and telecommunications through systematic presentation and discussion of research results. During the course, doctoral students analyze the current state of knowledge in selected areas of technical computer science, such as artificial intelligence, data analysis, and approximate reasoning systems.</p> <p>The doctoral seminar enables the development of skills in formulating research problems, designing research methods, and interpreting research results. A significant element of the course is the presentation of progress on the doctoral dissertation, scientific discussion, and the preparation of scientific publications.</p> <p>During the doctoral seminar, doctoral students develop broad competencies in conducting scientific research, critically analyzing the literature, presenting research results, and collaborating within the national and international scientific community.</p>				
COURSE LEARNING OUTCOMES AND METHODS OF EVALUATING LEARNING OUTCOMES				
Learning outcome	The description of the learning outcome defined for the course	Reference to learning outcomes for qualifications at Level 8 of the Polish Qualification Framework (PRK) (symbol)	Learning Format (Lectures, classes,...)	Method of assessment of learning outcomes (e.g. test, oral exam, written exam, project,...)
Knowledge: (no.)	<i>knows and understands</i>			
P8S_WG1	The student possesses extensive knowledge of technical computer science and telecommunications, particularly in areas such as algorithms and data structures, intelligent systems, machine learning, data analysis, and approximate inference systems.	P8S_WG	seminar	oral presentation, discussion,

P8S_WG2	Understands current research trends in technical computer science and telecommunications, including the development of artificial intelligence methods and data analysis with consideration of uncertainty and imprecision.	P8S_WG	seminar	oral presentation, discussion,
P8S_WG3	Understands scientific terminology and research methods used in technical computer science and telecommunications, and is able to use scientific literature in Polish and English.	P8S_WG	seminar	oral presentation, discussion,
Skills: (no.)	<i>is able to</i>			
P8S_UW1	Based on knowledge from various fields of science, the student can identify and solve a research problem, define a goal, formulate a hypothesis and the subject of research, select and improve research techniques, methods, and tools, and draw conclusions based on research results.	P8S_UW	seminar	oral presentation, discussion, written assignments,
P8S_UW2	Can select and utilize available scientific literature to diagnose and solve research problems and innovative activities in their research, as well as apply appropriate techniques to create new elements of scientific achievement.	P8S_UW	seminar	oral presentation, discussion, written assignments,
P8S_UW3	Using their interdisciplinary knowledge to analyze and evaluate research results, expert opinions, and other scholarly works, they are able to formulate opinions, including critical judgments.	P8S_UW	seminar	oral presentation, discussion, written assignments,
P8S_UK6	They can speak publicly to present research results and participate in discussions on scientific, social, and professional topics in an international environment, using a foreign language at the B2 level of the European Framework of Reference for Languages.	P8S_UK	seminar	oral presentation, discussion, written assignments,
Social competence: (no.)	<i>is ready to</i>			
P8S_KK1	They are prepared to conduct a critical evaluation of achievements within the scientific discipline of technical information technology and telecommunications and to critically evaluate the contribution of their own research results to the scientific development of the discipline in which they are training.	P8S_KK	seminar	oral presentation, discussion, written assignments,

P8S_KK3	Thanks to their extensive knowledge, they solve various cognitive and practical problems.			P8S_KK	seminar	oral presentation, discussion, written assignments,
LEARNING FORMAT – NUMBER OF HOURS						
Semester (no.)	Lectures	Seminars	Lab classes	Placements	other	ECTS
I - VII	-	-	-	-	7 x 15 hrs. - 105 hrs.	7 x 2 ECTS - 14 ECTS
METHODS OF INSTRUCTION						
<ul style="list-style-type: none"> - <i>ACADEMIC DISCUSSION,</i> - <i>STUDY OF ACADEMIC LITERATURE,</i> - <i>MULTIMEDIA PRESENTATION,</i> - <i>PREPARATION AND PRESENTATION OF RESEARCH OBJECTIVES, RESEARCH METHODS, RESEARCH RESULTS,</i> - <i>FINAL PROJECTS,</i> - <i>PROGRESS IN THE PREPARATION OF A DOCTORAL DISSERTATION</i> 						
COURSE CONTENT						
<p>Semester I Topic 1: Current research directions in the discipline of technical computer science and telecommunications. Topic 2: Formulating a research problem, scientific hypotheses, and research objectives for a doctoral dissertation. Topic 3: Review of the scientific literature and analysis of the state of knowledge in the selected research area.</p> <p>Semester II Topic 1: Research methods in the area of doctoral research (computer experiment, simulations, data analysis). Topic 2: Fundamentals of fuzzy set theory and uncertainty modeling in information systems. Topic 3: Introduction to approximate inference systems and their applications in intelligent systems.</p> <p>Semester III Topic 1: Artificial intelligence and machine learning methods in scientific research. Topic 2: Fuzzy inference systems and approximate inference systems in data analysis and decision support. Topic 3: Presentation of preliminary results of doctoral students' research.</p> <p>Semester IV Topic 1: Modeling systems with uncertainty – applications of fuzzy set theory and approximate systems. Topic 2: Analyzing the impact of uncertainty-accounting measures and operators on proposed approximate inference models. Topic 3: Discussion of the results of doctoral students' research.</p> <p>Semester V Topic 1: Designing intelligent information systems using artificial intelligence methods. Topic 2: Integrating fuzzy logic methods, approximate systems, and machine learning. Topic 3: Practical and experimental applications.</p> <p>Semester VI Topic 1: Validation of computational models and quality assessment of intelligent systems. Topic 2: Methods of presenting research results in publications and at conferences. Topic 3: Preparation of scientific articles and participation in scientific discussions.</p>						

Semester VII**Topic 1:** Summary of doctoral student's research results.**Topic 2:** Development of a doctoral dissertation and the structure of scientific publications.**Topic 3:** Presentation of final research results and scientific discussion.**COURSE ASSESSMENT CRITERIA**

The doctoral student's continuous work is assessed each semester and academic year, including: research, expanding knowledge, literature study, commitment, and progress in preparing the doctoral dissertation. The course ends after each semester of completion: pass – pass, fail – fail.

Requirements:

The course grade is based on the percentage of points earned:

- up to 60% - failed - the doctoral student makes no progress in their research, does not expand their knowledge, does not study the required readings, does not participate in substantive discussions, and does not fulfill their academic obligations;

- 61% - 100% - passed - the doctoral student makes progress in their research, expands their knowledge, studies primary and secondary literature, participates substantively in discussions, and fulfills all academic obligations

TOTAL DOCTORAL STUDENT WORKLOAD REQUIRED TO ACHIEVE THE EXPECTED LEARNING OUTCOMES– NUMBER OF HOURS AND ECTS CREDITS

Activity	Number of hours
Scheduled course contact hours	7 x 15 hrs. – 105 hrs.
Other contact hours involving the instructor (duty hours, examinations)	6
Non-contact hours – student's own work (preparation for classes or examinations, project, etc.)	309
Total number of hours	420
Total number of ECTS credits	7 x 2 ECTS – 14 ECTS

INSTRUCTIONAL MATERIALS

Compulsory literature:	<ol style="list-style-type: none"> 1. Zadeh L.A., Fuzzy Sets, Information and Control, 1965, Academic Press. 2. Klir G., Yuan B., Fuzzy Sets and Fuzzy Logic: Theory and Applications, 1995, Prentice Hall. 3. Ross T., Fuzzy Logic with Engineering Applications, 2010, Wiley. 4. Pedrycz W., Gomide F., An Introduction to Fuzzy Sets: Analysis and Design, 2007, MIT Press. 5. Russell S., Norvig P., Artificial Intelligence: A Modern Approach, 2021, Pearson
Complementary literature:	Articles from renowned journals and conference proceedings (e.g. Scientific Reports, Information sciences, FUZZ-IEEE, ISD, and others).

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

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Date and signature of the Course instructor

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Approved by the Head of the Department or an authorised person