

A COURSE SYLLABUS – DOCTORAL SCHOOL
regarding the qualification cycle from 2025/2026 to 2028/2029

GENERAL INFORMATION ABOUT COURSE				
Course title	<i>THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN SCIENTIFIC OR ARTISTIC RESEARCH</i>			
Name of the unit running the course	Doctoral School of the University of Rzeszów			
Type of course (<i>obligatory, optional</i>)	compulsory			
Year and semester of studies	year I, semester II			
Discipline	interdisciplinary			
Language of Course	Polish/English			
Name of Course coordinator	Wiesław Paja, PhD, Eng., Prof. UR			
Name of Course lecturer	Wiesław Paja, PhD, Eng., Prof. UR			
Prerequisites	Knowledge, skills and social competences required to achieve learning outcomes at level 7 of the Polish Qualifications Framework.			
BRIEF DESCRIPTION OF COURSE (100-200 words)				
<p>The course aims to introduce doctoral students to the practical principles of artificial intelligence methods applied in the research process. The course introduces the issues of artificial intelligence (AI) in the context of scientific research and artistic creation. It covers an overview of machine learning methods, generative AI, data analysis and language models. Students will learn about the applications of AI in various fields and the ethical, legal and methodological principles of its use in research work.</p> <p>General objectives of the course:</p> <ul style="list-style-type: none"> • To present the possibilities of applying artificial intelligence (AI) methods in various fields of scientific and artistic research. • To develop competence in critically assessing the role and limitations of AI in science and art. • To introduce the ethical, legal, and methodological aspects of using artificial intelligence in research work. • To stimulate reflection on the impact of AI on creativity, science, and society. 				
COURSE LEARNING OUTCOMES AND METHODS OF EVALUATING LEARNING OUTCOMES				
Learning outcome	The description of the learning outcome defined for the course	Relation to the degree programme outcomes (symbol)	Learning Format (Lectures, classes,...)	Method of assessment of learning outcomes (e.g. test, oral exam, written exam, project,...)
Knowledge (no.)	knows and understands, has knowledge			
P8S_WG1	He has extensive knowledge that allows him to confirm or refute existing ideas about artificial intelligence, especially in the context of conducting scientific research in various fields of science and art.	P8S_WG	Conversatory	project, discussion - class participation
P8S_WK1	He understands the broadly understood threat to the modern world resulting from the uncritical use of artificial intelligence.	P8S_WK	Conversatory	project, discussion - class participation
Skills (no.)	can			

P8S_UW1	Practically apply interdisciplinary knowledge about the possibilities of using artificial intelligence to diagnose and solve scientific problems, especially to define the purpose and subject of scientific research, develop research methods, techniques and tools, and creatively use the obtained research results for further scientific activities.			P8S_UW	Conversatory	project, discussion - class participation
P8S_UW2	Use available global literature on artificial intelligence to diagnose and solve research problems encountered and to create new elements of scientific achievement in the scientific discipline being explored.			P8S_UW	Conversatory	project, discussion - class participation
P8S_UK6	Actively participate in the national and international research and professional community, communicating in a foreign language at level B2 of the Common European Framework of Reference for Languages.			P8S_UK	Conversatory	project, discussion - class participation
Social competence (no.)	is ready to					
P8S_KK2	Using the capabilities of artificial intelligence for scientific research or artistic activities, is ready to accept critical judgements about their own scientific or artistic achievements.			P8S_KK	Conversatory	project, discussion - class participation
P8S_KR1	Is aware of and prepared to undertake and develop the ethos of research and creative communities, including: conducting scientific or artistic activities independently, respecting the applicable rules of public ownership of the results of scientific or artistic activities and complying with the rules of intellectual property protection.			P8S_KR	Conversatory	project, discussion - class participation
Semester (no.)	Lectures	Seminars	Conversatory / Lab classes	Internships	others	ECTS
2	-	-	-	-	10	1
METHODS OF INSTRUCTION						
<p>- MULTIMEDIA PRESENTATIONS, INSTRUCTION, PRACTICAL EXERCISES, INDIVIDUAL EXERCISES, DISCUSSION; - TEACHING METHODS INVOLVING PRESENTATION, DEMONSTRATION, PRACTICAL WORK AND ACTIVE PARTICIPATION, DEPENDING ON THE SUBJECT OF EACH CLASS;</p>						

COURSE CONTENT

1. Introduction to AI in science and art. History of AI, definitions, interdisciplinary examples, the role of data, basics of machine learning.
2. ML and DL methods in scientific research. Classification, regression, CNN, RNN, Transformers, transfer learning; examples from science, biology, medicine.
3. AI in art and humanities. Generative AI, text and image analysis, AI-based art projects, machine co-authorship.
4. Transparency and ethics in AI research. Reproducibility, bias, copyright, AI Act, GDPR, researcher responsibility.
5. Workshop and conceptual presentations. Development of a research or artistic project concept using AI; group presentations.

COURSE ASSESSMENT CRITERIA

Form of assessment: graded pass.

Observation during classes, discussion, written assignment on a selected topic.
Active participation in class may raise the grade by half a point.

The grading scale used in the programme is as follows: 2.0; 3.0; 3.5; 4.0; 4.5; 5.0.

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

Activity	Number of hours
Scheduled course contact hours	10 hrs
Other contact hours involving the teacher (consultation hours, examinations)	0
Non-contact hours – student`s own work (preparation for classes or examinations, project, etc.)	20 hrs
Total number of hours	30 hrs.
Total number of ECTS credits	1

INSTRUCTIONAL MATERIALS

Compulsory literature:	Russell, S., Norvig, P. Artificial Intelligence: A Modern Approach. Pearson, 2022. Goodfellow, I., Bengio, Y., Courville, A. Deep Learning. MIT Press, 2016. Mitchell, M. Artificial Intelligence: A Guide for Thinking Humans. Farrar, Straus and Giroux, 2019. Boden, M. A. AI: Its Nature and Future. Oxford University Press, 2016.
Complementary literature:	Manovich, L. AI Aesthetics. Moscow, 2019. Crawford, K. Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence. Yale University Press, 2021. McCormack, J., d'Inverno, M. (eds.) Computers and Creativity. Springer, 2012. UNESCO. Recommendation on the Ethics of Artificial Intelligence. (2021). EU Artificial Intelligence Act – tekst legislacyjny i interpretacje.

*(1 ECTS CREDIT CORRESPONDS TO 25 - 30 HOURS OF THE TOTAL WORKLOAD OF A DOCTORAL STUDENT, NEEDED TO ACHIEVE THE ESTABLISHED EFFECTS).

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Date and signature of the Course lecturer

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Approved by the Head of the Department or an authorised person