

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	Medical sciences			
Language of Course	Polish/English			
Name of Course coordinator	Dr hab. n. med. inż. Dorota Bartusik - Aebisher, prof. UR			
Name of Course instructor	Dr hab. n. med. inż. Dorota Bartusik - Aebisher, prof. UR			
Prerequisites	Academic education at the master's degree 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 aim of the doctoral seminar is to organise knowledge, skills and social competences in the field of medical sciences, focused on the doctoral student's scientific interests. This will enable them to independently and effectively conduct scientific research in medical sciences and sub-disciplines of medical sciences. The subject matter of the classes is focused on the doctoral student's acquisition of the subject-specific and methodological specifics of conducting scientific research, its areas and directions, the most important findings and postulates, the achievements of its main representatives, and contemporary challenges. The aim of the doctoral seminar is to prepare doctoral students to undertake and correctly implement a research project in the form of planning and conducting scientific research, theoretical analysis of research results, and writing a doctoral dissertation, which is an original solution to a scientific problem in accordance with the statutory requirements in this regard.</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	Possesses extensive theoretical knowledge, supported by research experience and is familiar with current scientific achievements, including global ones, in the field of education in the scientific discipline of medical sciences, as well as general issues	P8S_WG	seminar	oral presentation, discussion

	in related disciplines and research topics to a degree that allows them to confirm or refute existing paradigms.			
P8S_WG2	He/she is familiar with the directions of scientific research in the scientific discipline of medical sciences and the latest discoveries, including global ones, in the discipline in which the education takes place.	P8S_WG	seminar	oral presentation, discussion
P8S_WG3	Knows, understands and is able to apply concepts used by scientists and specialists in the discipline of medical sciences and disciplines in their native and foreign languages, which are leading in the discipline.	P8S_WG	seminar	oral presentation, discussion
Skills: (no.)	<i>is able to</i>			
P8S_UW1	Based on their knowledge in various fields of science, they are able to identify and solve scientific research problems, define objectives, formulate hypotheses and research topics, select and improve research techniques, methods and tools, and draw conclusions based on scientific research results.	P8S_UW	seminar	oral presentation, discussion, written assignments
P8S_UW2	They are able to select and use available scientific literature to diagnose and solve research problems and innovative activities in their research work, as well as apply the appropriate tools to create new elements of scientific output.	P8S_UW	seminar	oral presentation, discussion, written assignments
P8S_UW3	Using their interdisciplinary knowledge to analyse and evaluate the results of scientific research, expert work and other scientific studies, they are able to formulate opinions, including critical judgements.	P8S_UW	seminar	oral presentation, discussion, written assignments
P8S_UK6	Is able to speak in public to present scientific research results and participate in discussions on scientific, social and professional topics in an international environment, using a foreign language at level B2 of the Common European Framework of Reference for Languages.	P8S_UK	seminar	oral presentation, discussion, written assignments
Social competence: (no.)	<i>is ready to</i>			
P8S_KK1	Is prepared to critically evaluate achievements within the scientific discipline of medical science and to critically evaluate the contribution of their own research	P8S_KK	seminar	oral presentation, discussion,

	results to the scientific development of the discipline in which they are studying.				written assignments	
P8S_KK3	Thanks to their extensive knowledge, they can 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 godz. -105 godz.	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						
Semester I						
<p>Topic 1: Introduction to medical chemistry: Classification of colchicine as a pseudoalkaloid (an alkaloid with an atypical carbon skeleton, derived from <i>Colchicum autumnale</i>). Introduction to photodynamics: History of the use of light in medicine, basic definitions and therapeutic goals.</p> <p>Topic 2: Physical basis of phototherapy: Electromagnetic radiation spectrum (UV, IR, visible light) and principles of safe working with lasers and LED lamps.</p> <p>Topic 3: Organic chemistry: Analysis of the tricyclic structure (rings A, B and the seven-membered tropolone ring C) and the reactivity of functional groups. Photosensitizers: Classification (I, II and III generation), characteristics of an ideal preparation (e.g. ALA, MAL) and mechanisms of their selective accumulation in tissues.</p>						
Semester II						
<p>Topic 1: Mechanisms of phototoxic reactions: Photocytotoxic processes, the role of singlet oxygen in the destruction of pathological cells and types of photooxidation reactions.</p> <p>Topic 2: Photodynamic diagnosis (PDD): The use of fluorescence in the detection of precancerous and cancerous lesions.</p> <p>Topic 3: Biochemistry and molecular biology: Mechanism of interaction with microtubules. Colchicine binds to tubulin, inhibiting its polymerisation, which leads to the arrest of mitosis in the metaphase phase.</p>						
Semester III						
<p>Topic 1: Medicinal chemistry: Investigation of the relationship between structure and activity (QSAR). Design and synthesis of analogues, e.g. thiocolchicine derivatives, with potential anti-cancer activity.</p> <p>Topic 2: Modern therapies: The role of colchicine in the prevention of cardiovascular events and research on its effect on the inflammatory response in viral diseases (e.g. the COLCORONA study)</p> <p>Topic 3: Toxicology: Analysis of the narrow therapeutic index and side effects (nausea, vomiting, diarrhoea) resulting from the inhibition of cell division in rapidly dividing tissues.</p>						
Semester IV						
<p>Topic 1: Inhibition of NLRP3 inflammasome: This is one of the most important discoveries of recent years. Research confirm that colchicine directly blocks NLRP3 inflammasome activation, preventing the</p>						

conversion of pro-interleukin-1 β to active interleukin-1 β (IL-1 β) – a key mediator of inflammation in gout and heart disease

Topic 2: Interaction with tubulin: The classic molecular mechanism involves binding to β -tubulin, which inhibits its polymerisation in microtubules. In 2025, scientists are using molecular docking to design new colchicine derivatives that are expected to be more effective at destroying cancer cells with less toxicity to healthy tissue.

Topic 3: CHIP-mediated haematopoiesis: Modern clinical trials (including one ongoing in December 2025) are investigating whether colchicine can counteract the negative effects of CHIP mutations on endothelial function in patients with heart failure.

Semester V

Topic 1: Cardiology: The FDA has approved the use of colchicine to prevent cardiovascular events in at-risk patients.

Topic 2: Oncology: Ongoing work on synthetic analogues of colchicine that act as mitosis inhibitors.

Topic 3: Safety: Due to its narrow therapeutic index, monitoring of renal and hepatic parameters is recommended.

Semester VI

Topic 1: Instrumental analysis: Identification of colchicine using spectroscopic (NMR, IR) and chromatographic (HPLC) methods in plant materials

Topic 2: Colchicine mechanism and pharmacokinetics

Topic 3: Colchicine mechanism and pharmacodynamics

Semester VII

Topic 1: Summary and evaluation of current knowledge about colchicine

Topic 2: Evaluation of the contribution of own research results on colchicine to the scientific development of medical science

Topic 3: New research and cognitive problems

COURSE ASSESSMENT CRITERIA

The assessment covers the doctoral student's continuous work in each semester and academic year in the following areas: conducting research, expanding knowledge, studying literature and other sources, commitment and progress in preparing the doctoral dissertation.

The course ends after each semester of implementation:

pass – pass,

fail – fail.

Requirements

The following percentage of points obtained is used in the assessment of the course:

- up to 60% - fail - the doctoral student is not making progress in the research planned and agreed with the supervisor, is not expanding their knowledge, is not studying literature, normative acts, case law, is not participating in substantive discussions, is not fulfilling their assigned scientific duties;

- 61% - 100% - pass - the doctoral student is making progress in the scientific research planned and agreed with the supervisor, is expanding their knowledge, studying literature, normative acts and case law, participating in substantive discussions, and fulfilling all the scientific duties assigned to them

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 godz. – 105 godz.
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:	Colchicine in Agriculture, Medicine, Biology and Chemistry Paperback – June 1, 2013 by Orié Jacob Eigsti (Author), Pierre Dustin Jr (Author)
Complementary literature:	Advances in Photodynamic Therapy Basic, Translational, and Clinical By Michael R. Hamblin, Paweł Mróz · 2008

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

.....
Date and signature of the Course instructor

.....
Approved by the Head of the Department or an authorised person