

A COURSE SYLLABUS – DOCTORAL SCHOOL
REGARDING THE QUALIFICATION CYCLE FROM 2023 TO 2027.

GENERAL INFORMATION ABOUT COURSE				
Course title	Doctoral Seminar			
Name of the unit running the course	Doctoral School at the University of Rzeszów			
Type of course (<i>obligatory, optional</i>)	obligatory			
Year and semester of studies	Year I-IV / Semester I-VII			
Discipline	Mathematics			
Language of Course	Polish			
Name of Course coordinator	Prof. dr hab. Wiesław Śliwa			
Name of Course lecturer	Prof. dr hab. Wiesław Śliwa			
Prerequisites	Knowledge of mathematics at the master's level			
BRIEF DESCRIPTION OF COURSE (100-200 words)				
<p>The aim of the doctoral seminar is to deepen and systematize the current knowledge related to the subject of the doctoral dissertation, to develop the skills of formulating and solving research problems and the ability to present the results of scientific work. The issues raised as part of the subject and the projects implemented will also serve to prepare the doctoral student for the completion of the doctoral thesis and the presentation of the obtained research results. In addition, the doctoral seminar will be aimed at developing the doctoral student's search skills important from the point of view of the substantive and scientific value of publications in the field of the research topic being pursued.</p>				
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)			
1	World achievements, including general issues and selected specific issues - appropriate for the discipline of mathematics, essential for his doctoral project.	P8S_WG1	Seminar	Oral statement, discussion
2	The latest achievements in the subject of the doctoral dissertation and the conceptual framework of the discipline	P8S_WG2 P8S_WG3	Seminar	Oral statement, discussion
3	Research methodology, including the principles of research planning and implementation using proper research techniques and tools	P8S_WG4	Seminar	Oral statement, discussion
Skills (no.)	(Able to)			
1	Define the purpose and subject of scientific research, formulate	P8S_UW1	seminar	Oral statement,

	research hypotheses; develop research methods, techniques and tools and apply them creatively; draw conclusions based on scientific research.			discussion
2	Use scientific literature to identify and solve research problems	P8S_UW2	seminar	Oral statement, discussion
3	Critically analyze and evaluate the results of scientific research and their contribution to the development of knowledge	P8S_UW3	seminar	Oral statement, discussion
4	Speak English to the B2 level of the Common European Framework of Reference for Languages (CEFR) to a degree that allows for participation in the international scientific and professional environment	P8S_UK6	seminar	Oral statement, discussion
Social competence (no.)	(Ready to)			
1	Critical analysis of their research achievements and confrontation of his research results with those obtained by other mathematicians	P8S_KK1	seminar	Oral statement, discussion
2	Recognize the importance of knowledge in solving cognitive and practical problems	P8S_KK3	seminar	Oral statement, discussion
3	Systematic updating of one's knowledge by getting acquainted with the latest scientific literature in the subject of the doctoral thesis	P8S_KK3	seminar	Oral statement, discussion

LEARNING FORMAT – NUMBER OF HOURS

Semester (no.)	Lectures	Seminars	Lab classes	Internships	others	ECTS
			105			14

METHODS OF INSTRUCTION

Discussion; work with the text paper / project; multimedia presentation

COURSE CONTENT

Preparation of the doctoral student to conduct scientific work in the subject of the doctoral project.

Analysis of available literature on the subject of the doctoral thesis

Expanding knowledge in the field of the subject of the doctoral dissertation.

Improving workshop skills and writing competences,

Critical analysis of scientific achievements within the discipline mathematics and drawing inspiration

from it

Evaluation of own achievements and research projects

Acquiring materials for scientific work (source queries, libraries, e-resources)

Preparation of doctoral student to present the results of own research using modern IT tools

Preparing and editing scientific articles

Development of research results and their presentation

Discussion of the research results and their summary

Procedures for disseminating own research results – principles of scientific integrity

COURSE ASSESSMENT CRITERIA

Implementation of scientific research. Presenting the results of own research at seminars and scientific conferences. Preparation of manuscripts of scientific articles. Progress in preparing a doctoral dissertation.

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	$7 \times 15 = 105$
Other contact hours involving the teacher (consultation hours, examinations)	---
Non-contact hours – student's own work (preparation for classes or examinations, project, etc.)	210
Total number of hours	315
Total number of ECTS credits	14

INSTRUCTIONAL MATERIALS

Compulsory literature:	<ol style="list-style-type: none"> 1. Tomkowicz, Grzegorz; Wagon, Stan The Banach-Tarski paradox. Second edition. Encyclopedia of Mathematics and its Applications, 163. Cambridge University Press, New York, 2016. xviii+348 pp. 2. Perez-Garcia, C.; Schikhof, W. H. Locally convex spaces over non-Archimedean valued fields. Cambridge Studies in Advanced Mathematics, 119. Cambridge University Press, Cambridge, 2010. xiv+472 pp. 3. Schikhof, W. H. Ultrametric calculus. An introduction to p-adic analysis. Cambridge Studies in Advanced Mathematics, 4. Cambridge University Press, Cambridge, 2006. xii+306 pp. 4. Schneider, Peter Nonarchimedean functional analysis. Springer Monographs in Mathematics. Springer-Verlag, Berlin, 2002. vi+156 pp.
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	<ol style="list-style-type: none"> 5. Burillo, Josep Groups and the Banach-Tarski paradox. (Catalan) Butl. Soc. Catalana Mat. 23 (2008), no. 2, 181–199 6. Dougherty, Randall; Foreman, Matthew Banach-Tarski decompositions using sets with the property of Baire. J. Amer. Math. Soc. 7 (1994), no. 1, 75–124. 7. Dougherty, Randall; Foreman, Matthew Banach-Tarski paradox using pieces with the property of Baire. Proc. Nat. Acad. Sci. U.S.A. 89 (1992), no. 22, 10726–10728. 8. Banach, Stefan; Tarski, Alfred: Sur la décomposition des ensembles de points en parties respectivement congruentes, „Fundamenta Mathematicae” 6 (1924), s. 244–277. 9. Dekker, Th. J. Decompositions of sets and spaces. I, II. Nederl. Akad. Wetensch. Proc. Ser. A 59. Indag. Math. 18 (1956), 581–589, 590–595. 10. Tits, J. Free subgroups in linear groups. J. Algebra 20 (1972), 250–270. 11. Traina, Charles R. Trace polynomial for two-generator subgroups of $SL(2, C)$. Proc. Amer. Math. Soc. 79 (1980), no. 3, 369–372. 12. Ershov, Mikhail; Golan, Gili; Sapir, Mark The Tarski numbers of groups. Adv. Math. 284 (2015), 21–53.
Complementary literature:	<ol style="list-style-type: none"> 1. Schneider, Peter p-adic Lie groups. Grundlehren der Mathematischen Wissenschaften. Springer, Heidelberg, 2011. xii+254 pp. 2. Lyndon, Roger; Schupp, Paul - Combinatorial Group Theory. Classics in Mathematics. Springer-Verlag, Berlin, 2001. xiv+339 pp. 3. Lang, Serge - Algebra. Graduate Texts in Mathematics. Springer-Verlag, New York, 2002. xvi+914 pp. 4. Engelking, Ryszard - General Topology. Second Edition. Sigma Series in Pure Mathematics, Heldermann Verlag, Berlin, 1989. viii+529 pp. 5. Databases of scientific publications 6. Kolman R., Poradnik dla doktorantów i habilitantów. Oficyna Wydawnicza Ośrodka Postępu Organizacyjnego. , Bydgoszcz, 2000 7. Apanowicz J. - Metodologiczne uwarunkowania pracy naukowej : prace doktorskie, prace habilitacyjne. warszawa : "Difin". 2005. 8. Stępień B. - Zasady pisania tekstów naukowych : prace doktorskie i artykuły. Wydawnictwo Naukowe PWN. Warszawa. 2022.