A COURSE SYLLABUS – DOCTORAL SCHOOL
REGARDING THE QUALIFICATION CYCLE FROM 2023/2024 TO 2027/2028

GENERAL INFORMATION ABOUT COURSE	
Course title	*DOCTORAL SEMINAR*
Name of the unit running the course	Doctoral School at University of Rzeszów
Type of course *(obligatory, optional)*	Compulsory
Year and semester of studies	Year I-IV / Semester I-VII
Discipline	Mathematics
Language of Course	Polish language
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)

The aim of the doctoral seminar is to deepen and systematise the present knowledge of the student related to the topic of the doctoral dissertation, shaping the skills of formulating and solving research problems and the ability to present the results of scientific work. The issues raised within the subject and the projects carried out will also serve to prepare the doctoral student to write his/her doctoral dissertation and to present the research results obtained. In addition, the doctoral seminar will aim to develop in the doctoral student the ability to search for important, from the point of view of content and scientific value, publications in the field of the implemented research topic.

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			
1. **P8S_WG1**	The world output, including general issues and selected specific issues - appropriate for the discipline of mathematics, relevant for his/her doctoral project .	**P8S_WG**	seminar	oral statement, discussion
2. **P8S_WG2 P8S_WG3**	The latest developments in the topic of the realized doctoral dissertation and the conceptual grid of the discipline, including foreign language.	**P8S_WG**	seminar	oral statement, discussion
Skills (no.)	can			
1. **P8S_UW1**	Define the aim and subject of scientific research, formulate research hypotheses, - develop methods, techniques and research tools and creatively apply them, - make conclusions on the basis of scientific research.	**P8S_UW1**	seminar	oral statement, discussion

2. **P8S_UW2**	Use scientific literature to identify and solve research problems, and use knowledge of the workshop to create further elements of the existing body of work.	**P8S_UW**	seminar	oral statement, discussion
3. **P8S_UW3**	Critically analyse and evaluate scientific research results and their contribution to knowledge.	**P8S_UW**		oral statement, discussion
4. **P8S_UK6**	Using English at the B2 level of the European Common European Framework of Reference for Languages actively participating in the international scientific and professional environment.	**P8S_UK**	seminar	oral statement, discussion
Social competence (no.)	is ready to			
1. **P8S_KK3**	Systematically update his knowledge by familiarising himself with the latest scientific literature in the subject of his doctoral dissertation and recognising the importance of knowledge in solving cognitive and practical problems.	**P8S_KK**	seminar	oral statement, discussion
2. **P8S_KK1**	Critically analyse his research achievements and confront his research results with those obtained by other mathematicians.	**P8S_KK**	seminar	oral statement, discussion

LEARNING FORMAT – NUMBER OF HOURS

Semester (no.)	Lectures	Seminars	Lab classes	Internships	others	ECTS
I	-	-	-	-	15	2
II	-	-	-	-	15	2
III	-	-	-	-	15	2
IV	-	-	-	-	15	2
V	-	-	-	-	15	2
VI	-	-	-	-	15	2
VII	-	-	-	-	15	2
total number of hours of subject completion					**105**	**14 ECTS**

METHODS OF INSTRUCTION

Discussion, work with text, paper / project, multimedia presentation.

COURSE CONTENT

Seminar:
- Preparation of the doctoral student to conduct scientific work in the topic of the ongoing doctoral project.
- To analyse the available literature in the topic of the doctoral dissertation.
- Expanding the knowledge of the dissertation topic.
- Improving workshop skills and writing competence.
- To critically analyse the scientific output within the discipline of mathematics and draw inspiration from it.
- To evaluate one's own scientific achievements and projects.
- Acquiring materials for scientific work (source searches, libraries, e-resources).
- Preparing the doctoral student to present the results of their own research using modern IT tools.
- Preparing and editing scientific articles.
- Elaboration of research results and their presentation.

- Discussing research results and summarising them. - Procedures for dissemination of own research results - principles of research integrity.	

COURSE ASSESSMENT CRITERIA

The continuous work of the doctoral student in each semester and academic year is assessed in terms of:
- implementation of scientific research;
- presentation of own research results at seminars and scientific conferences;
- preparation of manuscripts of scientific articles; - progress in the preparation of the doctoral dissertation.
Possible semester grades are: 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	**7 x 15 hrs - 105 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.)	**315 hrs.**
Total number of hours	**420 hrs.**
Total number of ECTS credits*	**14**

INSTRUCTIONAL MATERIALS

Compulsory literature:	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. 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:	1. Schneider, Peter p-adic Lie groups. Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences]. 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.

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

....
Date and signature of the Course lecturer

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