A COURSE SYLLABUS – DOCTORAL SCHOOL

REGARDING THE QUALIFICATION CYCLE FROM 2025/2026 TO 2025/2026

GENERAL INFORMATION ABOUT COURSE	
Course title	**WORKSHOPS WITH AN EXPERT**
Name of the unit running the course	Doctoral School at University of Rzeszów
Type of course *(obligatory, optional)*	Spectral gap
Year and semester of studies	Year 2026 / semester Spring
Discipline	Mathematics
Language of Course	English
Name of Course coordinator	Prof Oleg Pikhurko
Name of Course lecturer	Prof Oleg Pikhurko
Prerequisites	Actively conducting scientific research as part of a doctoral dissertation in the discipline of mathematics. Knowledge of the basics of experimental research methodology, principles of developing results and the ability to work with scientific literature.

BRIEF DESCRIPTION OF COURSE
(100-200 words)

The aim of the "Workshops with an Expert" course is to support doctoral students at the Doctoral School in developing their research competencies and deepening their practical knowledge related to the implementation of research projects within the scientific discipline in which they are training and conducting research. The course is designed as a discussion and workshop, enabling an active exchange of experiences between participants and the instructor – a specialist experienced in conducting research and publishing results in scientific journals. The course covers topics related to research planning, the selection of analytical methods, the interpretation of results, the critical analysis of scientific literature, and the principles of preparing scientific publications. Discussion of current research issues faced by doctoral students and consultation on methodological solutions are also a significant element of the course. The course fosters skills in presenting research results, teamwork, and building a network of scientific contacts.

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)**			
P8S-WG2	Possesses knowledge of the directions of scientific research development and the latest achievements, including international ones, in the scientific discipline of mathematics and related disciplines.	P8S-WG	conversatory	credit
P8S_WK1	Knows and understands the impact of technological developments on scientific and civilizational progress, particularly in the area of mathematics, as well as the resulting consequences for the surrounding world.	P8S-WK	conversatory	credit

Skills (no.)	**(Able to)**			
P8S_UW1	Based on interdisciplinary knowledge, identify and solve research problems related to mathematics, define research goals, formulate hypotheses and the subject of scientific research, develop research methods, techniques, and tools, and draw constructive conclusions based on research results.	P8S_UW	conversatory	credit
P8S_UK6	Using a foreign language at least at the B2 level of the Common European Framework of Reference for Languages, the student can present research findings, participate in discussions, and actively participate in scientific and professional debates in both national and international settings.	P8S_UK	conversatory	credit
P8S_UU1	The student can independently acquire and update knowledge, develop analytical skills based on current interdisciplinary scientific achievements, and inspire others to pursue research and development activities.	P8S_UU	conversatory	credit
P8S_UU2	The student can share their knowledge, inspire others, and support the learning process through the use of modern and innovative teaching methods and tools.	P8S_UU	conversatory	credit
P8S_UU3	Through continuous learning, the student can update their interdisciplinary knowledge, improve their own competences, and plan their own and others' development.	P8S_UU	conversatory	credit
Social competence (no.)	**(Ready to)**			
P8S_KK1	Is ready to critically evaluate scientific achievements within the chosen scientific discipline of mathematics, taking into account current research trends and research quality standards.	P8S_KK	conversatory	credit

P8S_KK2	Is ready to critically evaluate their own research contribution to scientific achievements within the chosen scientific discipline of mathematics, in the area of their interests and research.	P8S_KK	conversatory	credit
P8S_KK3	Is ready to solve theoretical and practical problems using his/her knowledge of the exact sciences of mathematics and related disciplines, particularly in the field of mathematical research.	P8S_KK	conversatory	credit

LEARNING FORMAT – NUMBER OF HOURS

Semester (no.)	Lectures	Seminars	Lab classes	Internships	others	ECTS
Spring	-	-	-	-	5	1

METHODS OF INSTRUCTION

A seminar with a multimedia presentation by the doctoral student, combined with a moderated scientific discussion on the research results, the form of presentation, and the interpretation of data. A problem-solving discussion and case study involving discussion of potential reviewer comments and questions from the doctoral committee.

COURSE CONTENT

Description of the issues covered:
Topic 1: Equidecompositions
Topic 2: Lyons-Nazarov theorem
Topic 3: Local spectral gap
Topic 4: Transference to acted-on spaces

COURSE ASSESSMENT CRITERIA

After completing a semester of classes, the doctoral student prepares a report thematically related to the course content. The applicable grading scale for the course is: (pass) - passed, (nzal) - failed.

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	5 hrs.
Other contact hours involving the teacher (consultation hours, examinations)	1 hrs.
Non-contact hours – student`s own work (preparation for classes or examinations, project, etc.)	24 hrs.
Total number of hours	30 hrs.
Total number of ECTS credits	1

INSTRUCTIONAL MATERIALS	
Compulsory literature:	L. GRABOWSKI AND A. MATHE AND O. PIKHURKO MEASURABLE EQUIDECOMPOSITIONS FOR GROUP ACTIONS WITH AN EXPANSION PROPERTY, JOURNAL OF EUR MATH SOC 24 (2022) 4277-4326
Complementary literature:	• BOUTONNET, R., IOANA, A., SALEHI GOLSEFIDY, A.: LOCAL SPECTRAL GAP IN SIMPLE LIE GROUPS AND APPLICATIONS. INVENT. MATH. 208, 715–802 (2017) • A. LUBOTZKY "DISCRETE GROUPS, EXPANDING GRAPHS AND INVARIANT MEASURES" , BIRKHAUSER, 2010

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

16.3.2026

Date and signature of the Course lecturer

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Approved by the Head of the Department or an authorised person