Program	Type of studies (cycle)	Third cycle
	Name of the program	Doctoral Studies in Mathematical and Computer Science

COURSE

Course title	**Advanced Topics in Algebra**

Course code	Semester	Course status	ECTS credits	Contact hours
PMAT-701	II	elective	10	30

Aims and intended learning outcomes

The aim of the course is to deepen and systematise students' advanced knowledge of algebra through the study of selected specialised topics aligned with their research interests. Particular emphasis is placed on the development of abstract mathematical thinking, rigorous reasoning, and the theoretical and methodological foundations required for independent research in algebra.

Upon successful completion of the course, students will be able to:

- demonstrate advanced understanding of selected topics in algebra and their underlying theoretical structures;
- critically analyse contemporary mathematical results and relevant research literature;
- formulate and investigate complex mathematical problems independently;
- apply advanced theoretical and methodological approaches to problems in algebra;
- construct rigorous mathematical arguments and critically evaluate the validity and scope of mathematical results;
- independently acquire and integrate specialised knowledge relevant to their research interests;
- communicate and present mathematical results clearly and precisely in accordance with high academic standards.

Course content/topics

The content of this course is not fixed. In accordance with the students' previously acquired knowledge at lower levels of education and their research interests, the course instructor(s) define a detailed course plan, which is subject to approval by the Study Council.

Possible thematic units include advanced topics in algebra, such as:

- The role of abstraction in modern algebra
- Connections between algebra and other areas of mathematics (geometry, combinatorics)
- Advanced group theory
- Advanced theory of rings and modules
- Polynomial algebra and applications to coding theory and cryptography

as well as other topics in algebra that are the focus of contemporary mathematical research.

LITERATURE

[1] Serge Lang, Algebra, Springer Verlag, 2002

[2] David Eisenbud, Commutative Algebra with a View Toward Algebraic Geometry, Springer Verlag,1995

[3] Thomas Becker, Volker Weispfenning, Heinz Kredel, Groebner Bases, Springer-Verlag, 1993

[4] Saunders Mac Lane, Categories for the Working Mathematician, Springer-Verlag

Grading

	Criterion	Points	Cut-off points
1.	Assignments	30	15
2.	Project	40	20
3	Final exam	30	20
	T o t a l	100	55