MAT.512UB/MAT.513UB: Noncommutative Algebra

Lecture:	11:45–13:15 Tue	@ SR11.32	Oct 1 – Jan 28
	10:30–11:15 Thu	@ SR11.32	Oct 3 – Jan 30
Exercises:	11:15–12:00 Thu	@ SR11.32	Oct 3 – Jan 30

Instructor: Prof. Eleonore Faber
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Office Hours: by appointment

Course Webpage: `https://imsc.uni-graz.at/faber/teaching-NCA-WS24.html`
This site has important information regarding lecture notes and all aspects of the course.

Prerequisites: Familiarity with abstract reasoning and proofs, basics of algebra. It will also be useful to have an inherent interest in geometry and a desire to challenge yourself with some difficult but very interesting mathematics.

Course Description: Noncommutative algebra is a very rich subject, dealing with a great many different types of rings. Applications range from representation theory, physics, topology, and number theory to functional analysis.
This course will provide an introduction to noncommutative algebra. Specific topics covered in this course will include module theory, simple and semi-simple, notherian and artinian rings and modules, and the theorem of Artin–Wedderburn. Further potential topics are path algebras, quotient rings, Goldie's theorem, orders in quotient rings, Krull and Gelfand–Kirillov dimension of rings and algebras.

References: There are many good books about Noncommutative Algebra. We will not follow any particular textbook, but recommended sources include:

- Goodearl and Warfield's *Introduction to Noncommutative Noetherian Rings* (fulltext .pdf via library login).
- Farb and Dennis' *Noncommutative Algebra* provides an excellent introduction to the basic material as well as some more specialized topics. (fulltext .pdf via library login)
- Lam's *A first Course in Noncommutative Rings* also gives a good introduction to ring theory. (fulltext .pdf via library login)

The following also contains more advanced topics but may also help in understanding the material:

- The book Noncommutative Noetherian Rings by McConnell and Robson offers a comprehensive and self-contained account of many more recent advances in noncommutative ring theory.

Exercises: The best way to learn mathematics is by actually doing it. As such, examples and some exercises will appear throughout the course. In the exercise slots, these will be discussed and each student will give a short presentation about a topic from the course.

Assessment: The final mark for the lecture part of this course depends 100% on an oral examination. The first possible date is the last week of the semester (week starting January 27, 2025), further possible dates are the first week of February (week starting February 3, 2025) or by appointment. For fixing a date, please email me.
Marks for the exercise class depend on a successful presentation.

Disclaimer: I reserve the right to change anything on this syllabus if I feel it will improve the quality of the course. All changes will be announced in class.

Have a great semester!