Module Description 24-M-AL-ANT Algebraic Number Theory

Faculty of Mathematics

Version dated Feb 22, 2026

This module guide reflects the current state and is subject to change. Up-to-date information and the latest version of this document can be found online via the page

https://ekvv.uni-bielefeld.de/sinfo/publ/modul/533524934

The current and valid provisions in the module guide are binding and further specify the subject-related regulations (German "FsB") published in the Official Announcements of Bielefeld University.

24-M-AL-ANT Algebraic Number Theory

Faculty

Faculty of Mathematics

Person responsible for module

Prof. Dr. Christopher Voll

Regular cycle (beginning)

This module is part of a long-term overall curriculum plan for the Master's programme, which ensures that modules with an amount of at least 20 CP are offered in all five fields each year. The module is offered at irregular intervals as part of this overall curriculum planning.

Credit points

10 Credit points

Competencies

Non-official translation of the module descriptions. Only the German version is legally binding.

Students master the basic contents and methods of Algebraic Number Theory, in particular they can independently carry out even very complex proofs in this field requiring a high level of mathematical expertise.
They are able to define central terms of the theory and apply them in context. They are familiar with applications of the theory and can use examples to illustrate concepts and theorems.
Furthermore, the students recognise further-reaching connections to mathematical facts already acquired. They can transfer and apply the knowledge and methods they have learnt so far to deeper mathematical problem areas. Students also expand their mathematical intuition as a result of more intensive study.
In the tutorials, students develop their ability to discuss mathematical topics and thus further prepare themselves for the requirements of the Master's module, in particular for the scientific discussion within the Master's seminar presentation and the defence of their Master's thesis.

Content of teaching

Central topics covered included:

- algebraic integers
- Dedekind rings
- number fields
- finiteness of class numbers of number fields
- Dirichlet's unit theorem
- ramification and local fields

Recommended previous knowledge

Solid knowledge of algebra

Necessary requirements

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Explanation regarding the elements of the module

Module structure: 1 SL, 1 bPr [1]

Courses

Title	Type	Regular cycle	Workload [5]	LP[2]
Lecture Algebraic Number Theory	lecture	This module is part of a long-term overall curriculum plan for the Master's programme, which ensures that modules with an amount of at least 20 CP are offered in all five fields each year. The module is offered at irregular intervals as part of this overall curriculum planning.	60 h (60 + 0)	2 [Pr]

Tutorials Algebraic Number Theory	exercise	This module is part of a long-term overall curriculum plan for the Master's programme, which ensures that modules with an amount of at least 20 CP are offered in all five fields each year. The module is offered at irregular intervals as part of this overall curriculum planning.	90 h (30 + 60)	3 [SL]

Study requirements

Allocated examiner	Workload	LP^2
Teaching staff of the course **Tutorials Algebraic Number Theory (exercise)** *Regular completion of the exercises, each with a recognisable solution approach, as well as participation in the exercise groups for the module's lecture. As a rule, participation in the exercise group includes presenting solutions to exercises twice after being asked to do so as well as regular contributions to the scientific discussion in the exercise group, for example in the form of comments and questions on the proposed solutions presented. The organiser may replace some of the exercises with face-to-face exercises.*	see above	see above

Examinations

Allocated examiner	Type	Weighting	Workload	LP^2
Teaching staff of the course **Lecture Algebraic Number Theory (lecture)** *(electronic) written examination in presence of usually 120 minutes, oral examination in presence or remote of usually 40 minutes, A remote electronic written examination is not permitted.*	e-Klausur o. Klausur o. mündliche e-Prüfung o. mündliche Prüfung	1	150h	5

Legend

| 1 | The module structure displays the required number of study requirements and examinations. |

1   The module structure displays the required number of study requirements and examinations.

2   LP is the short form for credit points.

3   The figures in this column are the specialist semesters in which it is recommended to start the module. Depending on the individual study schedule, entirely different courses of study are possible and advisable.

4   Explanations on mandatory option: "Obligation" means: This module is mandatory for the course of the studies; "Optional obligation" means: This module belongs to a number of modules available for selection under certain circumstances. This is more precisely regulated by the "Subject-related regulations" (see navigation).

5   Workload (contact time + self-study)

SoSe   Summer semester

WiSe   Winter semester

SL   study requirement

Pr   Examination

bPr   Number of examinations with grades

uPr   Number of examinations without grades