

Module Guide

24-M-AL-IMF Introduction to Modular Forms

Fakultät für Mathematik

Version dated Dec 14, 2025

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/533551511>

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-IMF Introduction to Modular Forms

Faculty

Fakultät für Mathematik

Person responsible for module

Frau Prof. Dr. Claudia Alfes

Herr Prof. Dr. Michael Spieß

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 the theory of modular forms, in particular they can independently carry out very complex proofs in this area requiring a high level of mathematical expertise. Students are able to define central concepts of the theory (e.g. modular forms, Hecke operators, L-functions) and apply them in context. They are able to combine methods from different areas, namely complex analysis, algebra and number theory.

Accordingly, 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 problems. 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

The following basic content of teaching from the field of Modular Forms is compulsory:

Modular group and upper half-plane, Modular forms for the modular group, Hecke theory, L-functions, Modular forms for congruence subgroups, Modular curves as Riemann surfaces

In addition, the following content of teaching can be covered, for example:

Modular forms of half-integral weight, singular moduli, real-analytic modular forms, Modular curves as algebraic curves and as moduli spaces, Eichler-Shimura theory

Recommended previous knowledge

Basic knowledge in complex analysis, algebra and some basic number theory

Necessary requirements

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Explanation regarding the elements of the module

Module structure: 1 SL, 1 bPr¹

Courses

Title	Type	Regular cycle	Workload ⁵	LP ²
Lecture Introduction to Modular Forms	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 Introduction to Modular Forms	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]
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Study requirements

Allocated examiner	Workload	LP ²
<p>Teaching staff of the course Tutorials Introduction to Modular Forms (exercise)</p> <p><i>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.</i></p>	see above	see above

Examinations

Allocated examiner	Type	Weighting	Workload	LP ²
<p>Teaching staff of the course Lecture Introduction to Modular Forms (lecture)</p> <p><i>(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.</i></p>	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.
 - 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