Syllabus Formalized Mathematics in Lean (Computer-assisted Mathematics – V3A6 / F4A1). WiSe 25/26

Instructors:
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Class times
Lecture on Tuesday 16 – 18 and Thursday 10 – 12 in the Zeichensaal
Exercise sessions are

- Tuesday 12 – 14 in SR 0.006. Tutor: **Hannah Scholz**, scholz.hannah@uni-bonn.de

- Friday 8 – 10 in SR 0.006. Tutor: **Pablo Cageao Hunduvilla**, s96pcage@uni-bonn.de

Office Hours
There is a Lean hacking session every Thursday 14:15 – 16:00 in seminar room N0.008, which you can join to work on Lean exercises, projects or to ask questions. A personal meeting can be scheduled upon request.

About the course
In this course you will learn how to explain mathematical theories to a computer using a computer program called Lean. Using the language of Lean you can write mathematical definitions, theorems and proofs, and then Lean can check whether your proofs are correct and contain no holes. In this course we will learn how to interact with Lean and write your own proofs in it, and we will prove basic results in various mathematical topics, including algebra, topology and analysis. The course involves weekly homework exercises, a small and a large project, and a final written exam.

Goals

- Learn to explain mathematics to the computer program Lean

- Improve your understanding of mathematical proofs

- Learn some new mathematics

- Contribute to projects using Git

- Learn computer skills, such as using VSCode

- Personal project management skills

Resources

- The online textbook *Mathematics in Lean* by Jeremy Avigad and Patrick Massot

- Learning resources on the Lean website:
  https://leanprover-community.github.io/learn.html

Registration
Make sure to register for the course on eCampus. Register for the exam on Basis.

Homework
For a large part of the course, there will be a weekly set of homework problems assigned on Thursday. You have to hand-in the homework one week later on Thursday before class. A score of 60% of the homework grade is necessary to be admitted to the final exam.

Projects
You will be required to complete two projects as part of the course, which must be satisfactory to be admitted to the final exam.
The first project consists of contributing to an open source project, by formalizing the statement of an open conjecture in mathematics.
The second project consists of proving a small mathematical theorem or developing a bit of theory by yourself or with one partner. The second project will count for your final grade.
More information about the projects will be given during the course.

Final Exam
There will be a written final exam, which will be *closed-book and no laptop/electronics allowed.* This will test whether you know what you're doing when using Lean. No deep knowledge of nonstandard tactics or Mathlib will be required.
To be admitted to the final exam, you will need a score of 60% of the homework grade and your projects must be satisfactory.

First exam time: Fr 20.02.2026 at 9 – 11 (GHS)
Second exam time: Sa 21.03.2026 at 9 – 11 (GHS)

Grades: Your final grade is fully determined by the final exam grade.

Code of conduct and ombudspersons:
Everyone attending this class will contribute to an inclusive and welcoming environment where we all treat each other professionally and with mutual respect, regardless of origin, beliefs, physical ability, gender or sexual identity. Discriminatory, racist, sexist, exclusionary, bullying, or harassing behavior will not be tolerated. In the event that you witness inappropriate behavior, please consider intervening if it is safe for you to do so and / or informing an ombudsperson. You might also consider contacting the victim and offering help.
The ombudspersons can be contacted at any time in the event of conflict between individuals, perceived misconduct, or any form of harassment. They are bound by secrecy.
The ombudsperson in mathematics is currently:
Dr. Regula Krapf (`krapf@math.uni-bonn.de`), Mathematical Institute
For more information, see
`https://www.mathematics.uni-bonn.de/en/department/fachgruppe-mathematik#fgombud`