

Mathematics Prep-Course for Scientific Computing

Winter Semester 2023/24

Jörg Liesen (04.09.2023)

The goal of this course is to provide a basic training in rigorous mathematical reasoning for the wide range of students with non-mathematical Bachelor degrees who enter the Scientific Computing master program at TU Berlin.

Taking part in the course is not mandatory, but highly recommended for all starting Scientific Computing students, even those with a mathematical Bachelor degree.

The course will run in the first two weeks before the start of the lectures of the Winter Semester 2023/24 at the TU Berlin (which is on October 16, 2023).

Technical details:

- Lecturer: Prof. Dr. Jörg Liesen, liesen@math.tu-berlin.de
- Lectures will be held online via Zoom. In order to get the Zoom link for the course, students should **send an email to the lecturer, preferably until September 30, 2023.**
- **First lectures: October 2, 2023, from 9:30 until 10:30 CET, and from 11:00 until 12:00 CET.**
- There usually will be two lectures in the weekday mornings (*not* on October 3, 2023, which is a public holiday in Germany). Further details about the schedule will be given in the first lecture.
- Students who successfully participate in the course will receive **3 credit points without a grade** that can be recognized as an **elective module** (according to §5 (6) of the Scientific Computing Study and Examination Regulations of July 7, 2021).
- Successful participation is based on attendance and successful solving of exercises. Details will be announced in the first lecture.

Content:

1. *Introduction to the Scientific Computing Program and this Prep-Course*
2. *Mathematical logic*

3. *Sets, maps and relations*
4. *Proof techniques: Direct proofs, proofs by contrapositive and contradiction, proofs with cases, mathematical induction*
5. *Overview of mathematical structures (groups, rings, fields)*
6. *The “architecture” of mathematics*
7. *Mathematical style, reading and writing mathematics*

Main References:

- Ethan D. Bloch, *Proofs and Fundamentals. A First Course in Abstract Mathematics*, 2nd ed., Springer, 2011
- Ulrich Daepf and Pamela Gorkin, *Reading, Writing, and Proving. A Closer Look at Mathematics*, 2nd ed., Springer, 2011
- Jörg Liesen and Volker Mehrmann, *Linear Algebra*, Springer, 2015