

Spring Semester 2020

Numerical Methods I

Syllabus

Summary

This course covers calculus-based numerical methods, in particular root finding, interpolation, approximation, quadrature (numerical integration), and a first introduction to the numerical solution of differential equations.

Contact Information

Instructor: Prof. Tobias Preusser
Email: t.preusser@jacobs-university.de
Phone: 200-3241 (@ Jacobs University)
218-59005 (@ Fraunhofer MEVIS)
Office hours: By appointment in Research I, 132

TA/grader: Ahmed Ali
Email: ah.ali@jacobs-university.de

Time and Place

Lectures: Mo 11:15 – 12:30 Lecture Hall Research II
We 11:15 – 12:30 Lecture Hall Research II

Textbook

- D. Kincaid and W. Cheney: Numerical Analysis: Mathematics of Scientific Computing, Any Brooks/Cole Publishing Company, 1991.
- W. Boehm and H. Prautzsch: Numerical Methods, AK Peters, 1993 (further reading)

Grading

The final grade will be computed as a percentage average with the following weights:

Homework:	40%
Final Exam:	60%

To compute the final grade the individual percentages for homework and final exams will be weighted accordingly.

Homework

In each class marked in the second column of the schedule below, an assignment sheet is given. The following rules apply:

- Solutions are due at the **beginning, i.e. 11:15 sharp**, of the **class meeting** indicated in the syllabus below.
- There will be **5** assignment sheets in total comprising **10** exercise problems.
- An assignment sheet will comprise further exercises for practice but without grading.
- **Late homework submission** leads to a **deduction** of 5 points per day

(assuming 30 points per homework).

- With an **official excuse of up to 4 days**, the deadline for the respective homework is **extended** by the same amount of days.
- With an **official excuse of more than 4 days**, the respective homework will **not count**.

Class Schedule

Class #	Assign- ment #	Date	Topic
1		Mo, 03. Feb. 2020	Introduction and some examples
2	1	We, 05. Feb. 2020	Number representations
3		Mo, 10. Feb. 2020	Systems of linear equations, Gaussian Elimination
4	2 (due 1)	We, 12. Feb. 2020	Pivoting; LU decomposition;
5		Mo, 17. Feb. 2020	Cholesky decomposition; Non-linear equations; Bisection method,
6	3 (due 2)	We, 19. Feb. 2020	Order of convergence; Newton's method;
7		Mo, 24. Feb. 2020	Secant method; Systems of nonlinear equations
8	4 (due 3)	We, 26. Feb. 2020	Polynomial interpolation; Lagrange interpolation
9		Mo, 02. Mar. 2020	Newton interpolation; Error analysis; Piecewise interpolation;
10	5	We, 04. Mar. 2020	Spline interpolation;
11	(due 4)	Mo, 09. Mar. 2020	Least squares approximation
12	6 (due 5)	We, 11. Mar. 2020	Difference schemes; Richardson extrapolation
13		Mo, 16. Mar. 2020	Quadrature rules;
14	(due 6)	We, 18. Mar. 2020	Wrap-up and preparation for final exam
15		We, 15. April 2020	Final Exam (in East Wing + Conference Hall, IRC)