

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  
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### 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	LU decomposition, Cholesky decomposition
5		Mo, 17. Feb. 2020	Non-linear equations; Bisection method, Newton's method, Secant method
6	3 (due 2)	We, 19. Feb. 2020	Polynomial interpolation; Lagrange interpolation
7		Mo, 24. Feb. 2020	Newton interpolation; Bezier curves;
8	4 (due 3)	We, 26. Feb. 2020	Piecewise interpolation; Spline interpolation
9		Mo, 02. Mar. 2020	Least squares approximation
10	5 (due 4)	We, 04. Mar. 2020	Difference schemes; Richardson extrapolation
11		Mo, 09. Mar. 2020	Quadrature rules
12	(due 5)	We, 11. Mar. 2020	Applications
13		Mo, 16. Mar. 2020	Wrap-up and preparation for final exam
14		<b>We, 18. Mar. 2020</b>	<b>Final Exam</b>