100211
Analysis I, Fall 2010

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Lectures: Tuesdays, 8:15-9:30, East Hall 4
Thursdays, 11:15-12:30, East Hall 4

Tutorials: Mondays, 9:00 pm, Quiet Study Area in College 3

Webpage: http://math.jacobs-university.de/pfander/teaching/analysis1_2010.php

Textbooks: W. Rudin, *Principles of Mathematical Analysis*, McGraw Hill Text
(The classic textbook, fairly expensive, int. edition ca. 60€)

M. Rosenlicht, *Introduction to Analysis*, Dover Publications
(Excellent cheap alternative to Rudin, ca 15€)

C. C. Pugh, *Real Mathematical Analysis*, Springer
(Excellent modern book, my favorite, ca 50€)

Grading: Your grade is determined by how many points you obtain out of 1000 possible points, i.e., the grade is assigned according to the table on the right. Points can be collected via Homework (300 pts), Quizzes (180 pts), Midterm Exam (220 pts) and Final (300 pts)

Point range	***Grade***
950 - 1000	*1.00*
905 - 949	*1.33*
860 - 904	*1.67*
815 - 859	*2.00*
770 - 814	*2.33*
725 - 769	*2.67*
680 - 724	*3.00*
635 - 679	*3.33*
590 - 634	*3.67*
545 - 589	*4.00*
500 - 544	*4.33*
455 - 499	*4.67*
0 - 454	*5.00*

Homework: Twelve problem sets will be assigned during the semester. Each homework is worth 30 points; the sum of your best 10 homework scores will determine your total homework score, i.e., your two worst homework scores are dropped at the end of the semester. The homework is due Mondays in the tutorials. Every day you hand in your homework late will be penalized by a deduction of 5 points from the respective homework score.

We encourage you to discuss homework problems with fellow students. However, the homework you hand in may not be copied and must reflect your own understanding of the material.

Quizzes Eight quizzes will be given in class (see schedule), each carrying 30 points. Only the best six quizzes will count towards your quiz score (out of 180).

Quizzes will be 5-10 minute closed book examinations. Makeup quizzes are only administered if you missed more than two quizzes (excused).

Exams: The midterm exam is worth 220 points. The final exam, worth 300 points, will be scheduled within finals week.

The material used as well as the rules for the exam will be announced one week prior to the exam.

Prerequisites: We shall only assume the most basic notions of set theory, two-valued logic (true or false), proof by induction, epsilon-delta definition of continuity of real valued functions on the real line, and the basic arithmetic operations on integers and rational numbers. A certain level of mathematical maturity (achievable through courses such as Foundations of Mathematics) is assumed.

Syllabus: A sound understanding of the topological and algebraic structure of the real number system is of fundamental importance to most mathematical fields! To convey this and some of its consequences is the principle goal of Analysis I / II.

In order to discuss topics such as convergence of sequences and series, and continuity, integration and differentiation of functions defined on the real line, we need a solid understanding of the real number system. Hence, Analysis I includes an extensive discussion of real numbers, which will then be followed by the introduction of complex numbers. The concept of distance between two real or complex numbers will lead to the definition of converging sequences and series, and of continuous functions on the real line. These ideas can be generalized to sequences in and functions on abstract metric spaces, i.e., on sets that allow us to assign a distance to any pair of two of its elements. Many results in calculus such as the intermediate and maximal value theorem can be generalized to the general (and abstract) metric space set up. Introducing general concepts such as compactness and connectedness have the additional advantage of leading to a better understanding of calculus itself. The last segment of Analysis I will deal with derivatives of functions on the real line: a function is differentiable if it can be locally approximated by linear functions. To obtain better approximations one can replace linear functions with higher order polynomials. This will lead to the concept of Taylor polynomials and series.

This course will be roughly divided into the following sections:

I. Relations and functions
II. Real and complex numbers
III. Convergent sequences and series
IV. Metric spaces and continuous functions
V. Differentiation

Schedule:

	Monday	Tuesday	Wednesday	Thursday	Friday
W1	06. Sep	07. Sep	08. Sep	09. Sep	10. Sep
W2	13. Sep HW1	14. Sep Q1	15. Sep	16. Sep	17. Sep
W3	20. Sep HW2	21. Sep Q2	22. Sep	23. Sep	24. Sep
W4	27. Sep HW3	28. Sep	29. Sep	30. Sep	01. Okt
W5	04. Okt HW4	05. Okt Q3	06. Okt	07. Okt	08. Okt
W6	11. Okt HW5	12. Okt Q4	13. Okt	14. Okt	15. Okt
W7	18. Okt HW6	19. Okt	20. Okt	21. Okt MT	22. Okt
W8	25. Okt HW7	26. Okt	27. Okt	28. Okt	29. Okt
W9	01. Nov	02. Nov Q5	03. Nov	04. Nov	05. Nov
W10	08. Nov HW8	09. Nov Q6	10. Nov	11. Nov	12. Nov
W11	15. Nov HW9	16. Nov	17. Nov	18. Nov	19. Nov
W12	22. Nov HW10	23. Nov Q7	24. Nov	25. Nov	26. Nov
W13	29. Nov HW11	30. Nov Q8	01. Dez	02. Dez	03. Dez
W14	06. Dez	07. Dez	08. Dez	09. Dez	10. Dez HW12
	13. Dez	14. Dez	15. Dez	16. Dez	17. Dez