

# Syllabus for Advanced Calculus I and II

(Elements of Analysis I and II, JTME-120203 and JTME-120204)

Fall Semester 2017

## 1 Official Course Description

This course covers much the same material as Calculus I/II, but includes proofs as well as some foundational material. It is designed as a “drop-in” replacement for Calculus I and should be considered by all students who have enjoyed a dedicated mathematics specialization at high school level. It is mandatory for students in the Mathematics major.

## 2 Contact Information

Instructor: Prof. Sören Petrat  
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Office: Research I, room 112  
TA: TBA  
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## 3 Time and Place

Mon 11:15 – 12:30, East Hall 4

Wed 11:15 – 12:30, East Hall 4

First class: September 4, 2017; last class: December 6, 2017; no class on October 30, 2017 (reading day)

## 4 Textbooks

This class does not follow one particular textbook, but takes material from several different ones:

- E. Hairer, G. Wanner, *Analysis by its History* (Springer). This course covers most of chapter I and parts of chapter II. In general, this book might be a bit harder and more detailed than this course.
- K. F. Riley, M. P. Hobson and S. J. Bence, *Mathematical Methods for Physics and Engineering* (Cambridge University Press). This course covers roughly the contents of Chapters 1, 2, 3, 4, 12, 14, 15.

## 5 Exercises

Each week on Monday (except the first and exam weeks) there will be an exercise sheet/homework assignment. These are an integral part of the coursework and working on the exercise sheets consistently is the best preparation for the exams.

- The solutions have to be handed in at the beginning of the classes.
- No late submissions are accepted.
- For each part I and II of this course, the worst exercise sheet is not considered for grading, in order to compensate for sickness, late adding etc.
- It is encouraged to discuss the exercise sheets with your classmates (e.g., discuss how to come up with the solution or what the right way of approaching the problem is). On the other hand, the solutions must be written down and handed in individually! Copying the solutions from somebody else is a violation of Academic Integrity.

## 6 Quizzes

Each week on Wednesday (except the first and exam weeks) there will be a short quiz at the end of class. These quizzes will be very elementary and are supposed to make sure that you are consistently following the material. For each part I and II of this course, the worst quiz is not considered for grading.

## 7 Exams

There will be two exams, one at the end of part I (“midterm”) and one at the end of part II (“final”). The midterm will cover all material from part I and the final will cover material from both parts with emphasis on material from part II.

## 8 Grading

There is a final grade for part I and a final grade for part II of this course. The grades are weighted as follows:

	Quizzes:	20%
Part I:	Homework:	20%
	Exam (Midterm):	60%
	Quizzes:	15%
Part II:	Homework:	15%
	Exam (Midterm):	70%

## 9 Tentative Class Schedule

### Advanced Calculus I

Session	Date	Topic
1	Sep 4	Polynomials, roots, factorization
2	Sep 6	Binomial expansion, binomial coefficients
3	Sep 11	Limits and continuity
4	Sep 13	Power series, convergence tests
5	Sep 18	Special function and their power series
6	Sep 20	Complex numbers
7	Sep 25	Derivatives I
8	Sep 27	Derivatives II
9	Oct 2	Taylor series
10	Oct 4	Newton’s method
11	Oct 9	Minimization/Maximization problems
12	Oct 11	Integration I
13	Oct 16	Integration II
14	Oct 18	<b>Midterm Exam</b>

## Advanced Calculus II

Session	Date	Topic
1	Oct 23	Integration III
2	Oct 25	Integration IV
	Oct 30	<b>Reading Day, no class</b>
3	Nov 1	ODEs I
4	Nov 6	ODEs II
5	Nov 8	ODEs III
6	Nov 13	ODEs IV
7	Nov 15	Fourier series I
8	Nov 20	Fourier series II
9	Nov 22	Fourier series III
10	Nov 27	Differentiation and Integration in several variables I
11	Nov 29	Differentiation and Integration in several variables II
12	Dec 4	Differentiation and Integration in several variables III
13	Dec 6	Differentiation and Integration in several variables IV
	TBA	<b>Final Exam</b>