Math 5070 Applied Analysis Fall 2016

Instructor: Jan Mandel, room SCB 4315, 303-315-1703, jan.mandel@ucdenver.edu
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Text: 1. R. Johnsonbaugh and W. E. Pfaffenberger, Foundations of Mathematical Analysis, Dover 2002. This book is easy to understand and is well written, and will be the primary source of material and exercises for this class. 2. W. Rudin, Principles of Mathematical Analysis, McGraw Hill, 3rd edition, 1976 & later printing.

Time and place: Mo-We 5:00-6:15 SCB 4125
Office hours: Mo-We 3:00-4:30, or by appointment.


Prerequisites: This course assumes that students have the equivalent of two semesters of undergraduate real analysis (e.g., MATH 4310 and MATH 4320). In particular: MATH 4310 - Calculus of one variable, the real number system, continuity, differentiation, integration theory, sequence and series; MATH 4320 - Convergence, uniform convergence; Taylor’s theorem; calculus of several variables including continuity, differentiation and integration.

Major topics (tentative): Johnsonbaugh and Pfaffenberger sec. 5, 10-64 (inf, sup, sequences, series, limits, metric spaces, derivatives, Riemann-Stieltjes integral, sequences and series of functions). Sec. 1-19 are assumed from prerequisites. Rudin Ch. 7 (equicontinuous families of functions, Stone-Weierstrass theorem), Ch. 9 – functions of several variables.

Time required: At least 10 hours a week, plus any time to (re)acquire the prerequisites. Different students will need different amounts of time depending on the level of their skill and retaining the prerequisites.

Communication: The class progress and homeworks given will be recorded in the notes file. The solutions to homeworks and grades will be on Canvas. I take photographs of boards, which will be stored in the photos directory.

Learning objectives: At the end of the course, students should be able to

- Understand proofs, their logic and structure, recognize correct and incorrect proofs, and produce counterexamples.
- Solve analysis problems, putting multiple methods together.
- Recognize a well-written rigorous proof, write solutions and proofs correctly and logically in complete English sentences, and avoid incorrect or misformulated statements.
Learning outcomes:

- Creative thinking – how to invent tentative solutions to mathematical problems. Where graded: Required to receive at least partial credit for a problem.
- Critical thinking – how to switch to validating mode, identify the faults of the tentative solution, and switch back to creative thinking to correct them. Where graded: Correct solution is required to receive full credit for a problem.
- Oral communication – how to present the solution at the board, and defend it in a discourse. Where graded: Reflected in the participation component of the grade.
- Problem solving – this is of course what the class is all about.
- Written communication – how to write the solution correctly at the proper level of detail and following the conventions explained in class. Where graded: Properly written solution is required to receive full credit for the problem.

Rationale: This class builds rigorous mathematical thinking and expression, which is essential when writing papers and theses. The class also helps to prepare for the PhD Preliminary Examination in Applied Analysis.

Class format: This is a problem solving class. Students will work in class in groups, with one of the group presenting the result. We will typically explain material by solving problems drawing on it. Lecturing will be limited, and you will need to review the prerequisites and read the covered sections from the textbook in advance.

Technology and group work: You may consult technology resources during group work in class or when working on homework. Studying in groups is encouraged. But any work you turn in must be yours, written from your own understanding of the subject. Copying from elsewhere or duplication of proofs (or even proofs that are very similar) will be considered academic dishonesty (not giving credit to the person who actually wrote the proof to begin with). But no technology or help from another person are allowed at exams.

Homework: There will be homework most weeks. You will always have at least a week to complete the homework. Homework will be due at the beginning of the class on the date indicated.

Exams: There will be two midterm exams on October 3 and November 7, and final during the finals wee. No book and no notes are allowed except for one handwritten letter-sized sheet (both sides). No use of calculators, computers, phones, or other electronic devices is allowed during the exams.

Grading: Individual graded problems are worth 10 points. Full credit requires:

- complete and correct mathematical argument
- no additional incorrect or out of context material
- correct mathematical writing

At least one problem from every homework will be graded in detail; the rest will be counted as 1 point for completion each. The points from all homeworks will be added
together to yield a single homework score. Each exam score will be scaled from 0 to 100% separately. The overall grade is determined as 60% for the 2 best from homeworks, midterm1, and midterm 2, and 30% for the final, and 10% class participation. Full participation credit requires at least two presentations in class. The letter grades are:

A >=90%, A->=85%, B+>=80%, B>=75%, B->=70, C>=55%, D>=40%.

Class attendance does not contribute to the grade but is highly recommended. Late homework credit is halved for each class period the homework is late.

**Missing exam:** If circumstances arise that prevent you from attending an exam, please contact me **ahead of time** as I will be much more lenient. Unexplained absences will require hard evidence such as a death certificate, hospital paperwork, etc.

**Conduct and Academic Dishonesty:** Students are required to know, understand, and comply with the CU Denver [Student Code of Conduct and CLAS Academic Dishonesty Policy](#). Academic dishonesty consists of plagiarism, cheating, fabrication and falsification, multiple submission of the same work, misuse of academic materials, and complicity in academic dishonesty. Cheating or other academic misconduct will result in no credit for the assignment or exam in question and will be handled according to the policy, which requires a letter to the student with copy to the Dean’s office.