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Required Text: Functions of One Complex Variable I, 2nd ed. by John B. Conway. Published by Springer-Verlag.

The first quarter of the complex analysis course is designed to provide an introduction to complex analysis, and to cover the majority of the topics on the syllabus for the complex analysis portion of the Ph.D. qualifying exam. There is a lot of material to cover, so expect that the pace will be vigorous. The core material is contained in chapters 3–6 of the text.

Complex analysis is a beautiful subject combining ideas from analysis, geometry and topology. It has connections with many areas of mathematics: number theory, algebra, differential equations, and differential geometry to name a few. Exploring these connections would make a nice continuation of this course, but unfortunately we will only have time to touch upon a few of them. Please let me know if there are specific topics beyond the core material which you would like to have included.

Grading: Regular problems sets (45%), a midterm exam (20%) and a final (35%).

Prerequisites: The listed prerequisite is Mth 411/511. The specific material needed can be summarized as fluency in basic metric space topology. We will use topology of the plane and sphere (open sets, closed sets, connected sets, sequences, continuous functions) without comment, as well as various ideas of convergence of sequences of functions, and various interchange of limit theorems. It would also be helpful to review some basic ideas from vector calculus, such as partial differentiation, line integrals and Green’s theorem. The material on metric spaces and topology of \( C \) can be found in chapter 2 of the text. I will not cover it in lecture.

You should also be familiar with arithmetic of complex numbers. This, as well as some geometry of the complex plane, is covered in chapter 1, sections 1–5. Some of this will be summarized in lecture, but with proofs omitted.

Other references: There are a number of other references for the material of this course. A few which I will be using include:

1. Complex Function Theory, by Maurice Heins
2. Complex Analysis, by Lars V. Ahlfors, any edition. A classic. The arguments often leave many details to the reader, but expose the main ideas.
3. Complex Analysis in One Variable, by R. Narasimhan. A clean condensed presentation at a higher level than Conway. There is a second edition with Y. Nievergelt as co-author.