Math 444 – Complex analysis (3 credits)
University of Hawai'i at Mānoa
Spring 2016

Course catalog description: Analytic functions, complex integration, introduction to conformal mapping.

Prerequisites: 244 or 253A; or consent. Recommended: 331

Recommended textbooks: Stephen D. Fisher's *Complex variables, Second edition.*

Extended description: This course is intended to introduce the student to the fundamentals of complex analysis. The content of the course should be balanced between the mathematical content of elementary complex analysis and computational applications. The results covered should be proved, though sometimes under hypotheses that aren't as general as possible.

The content to be covered is contained within the first three chapters of Fisher's book and includes: the necessary geometry, topology and algebra of the complex plane; elementary functions; a reminder of line integrals and Green's Theorem; analytic functions, power series, and the Cauchy–Riemann equations; Cauchy's Theorem and Cauchy's Formula, the Residue Theorem; the Maximum Modulus Principle; fractional linear transformations and conformal mapping.

Student learning outcomes: Upon successful completion of MATH 444, the student will

- have an understanding of the algebraic and geometric properties of the complex plane and the basic properties of analytic functions;
- understand the main theorems of the course and be able to apply them in computation;
- be able to independently construct rigorous arguments concerning the material.

Program objectives: In this advanced level course, students will be introduced to the theory of complex analysis. A successful student will be prepared to take a course in graduate level complex analysis and will be prepared to apply the theory in computations or physical models. Significant portions of MATH 444 build on material from Calculus, including limits and continuity, Taylor series and multivariate functions. Successful students of 444 will be able to deepen their understanding of these concepts through applications to the new domain of complex numbers. Math majors will be able to apply the introduction to proof techniques learned in lower level classes to the topics discussed. Both math majors and students from other disciplines will obtain insight into the connection between theory and computation, giving context and depth to more abstract mathematical topics such as the topology of the plane.