

MATHEMATICS 4310
COMPLEX FUNCTION THEORY

A differentiable real function need not have a continuous derivative; however, this can never happen in the theory of analytic functions. An analytic function can be differentiated as many times as you like. Can you imagine what the design of airplane wings would have been without knowledge of conformal mappings? Many improper integrals have pleasant behaviour in complex variable theory; for example

$$\int_0^{\infty} \frac{\sin x}{x} dx$$

Several difficult results have easy proofs using complex function theory, the fundamental theorem of algebra, for instance. The *fundamental theorem of algebra* says that every polynomial with real coefficients has a root in \mathbb{C} .

Text. *Complex Variables* by H. Silverman (Houghton Mifflin Company) or a similar book.

Marks. Typically, 20% for weekly assignments, 30% for a midterm test and 50% for the final examination.

Calendar description. **4310 Complex Function Theory** examines topology of \mathbb{C} , analytic functions, Cauchy's theorem with proof, Cauchy's integral formula, singularities, argument principle, Rouché's theorem, maximum modulus principle, Schwarz's lemma, harmonic functions, Poisson integral formula, analytic continuation, entire functions, gamma function, Riemann-Zeta function, conformal mapping. Prerequisite: Mathematics 3210 and 3301.

Offered. Winter