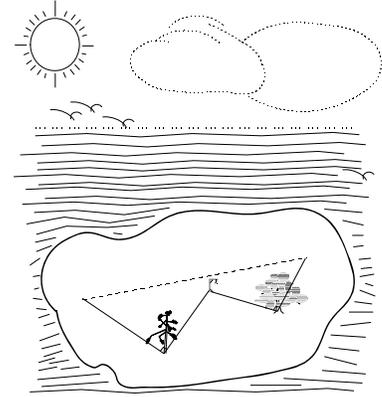


MATHEMATICS 3210
INTRODUCTION TO COMPLEX ANALYSIS

There was a young and adventurous man who found among his great-grandfather's papers a piece of torn parchment that revealed the precise location of a hidden treasure. The instruction reads:

Sail to ___ North latitude and ___ West longitude where thou wilt find a deserted island. There lieth a large meadow, not pent, on the north shore of the island where standeth a lonely oak and a lonely pine tree. There thou wilt see also an old gallows on which we once were wont to hang traitors. Start thou from the gallows and walk to the oak counting thy steps. At the oak thou must turn right by a right angle and take the same number of steps. Put here a spike in the ground. Now must thou return to the gallows and walk to the pine counting thy steps. At the pine thou must turn left by a right angle and see that thou takest the same number of steps, and put another spike into the ground. Dig halfway between the spikes; the treasure is there.



The instructions being quite clear and explicit, our young man chartered a ship and sailed to the South Seas. He found the island, the field, the oak and the pine, but to his great sorrow, the gallows was gone. Too long a time had passed: rain and sun and wind had disintegrated the wood and returned it to the soil, leaving no trace of the place where once it had stood. Our adventurous man fell into despair. Digging all over the field at random, he found nothing and sailed back empty-handed. A sad story for sure, but sadder to think that he might have easily located the treasure had he known a little about the arithmetic of *complex numbers*!!

This course begins with the definition and arithmetic properties of *complex numbers*. Then functions whose domain and range are complex numbers are introduced. The heart of complex analysis is the idea of *analytic function*. The beautiful Cauchy theory of integration is developed and, as immediate consequences, the Taylor and Laurent series expansions of complex functions are derived. The residue calculus naturally follows, with application to the so-called contour integration.

Text. In the past, two books have been used for this course: *Complex Variables and Applications* by R. V. Churchill and J. W. Brown (McGraw-Hill) (course content approximately chapters 1-6) and *Fundamentals of Complex Analysis for Mathematics, Science, and Engineering Students* by E. B. Saff and A. D. Snider (Prentice-Hall).

Marks. Usually, 20% for weekly assignments, 30% for a one-hour midterm examination and 50% for a comprehensive final examination at the end of the semester.

Calendar description. **3210 Introduction to Complex Analysis** examines complex numbers, analytic functions of a complex variable, differentiation of complex functions and the Cauchy-Riemann equations, complex integration, Cauchy's theorem, Taylor and Laurent series, residue theory and applications. Prerequisite: Mathematics 3000.

Offered. Fall