Syllabus for Complex Variables (One-Term)

Instructor: Yury Ustinovskiy, yu3@nyu.edu

Classes: WWH 312, Tuesday, Thursday 2:00-3:15PM

Office hours: WWH 827, Tuesday, Thursday 3:30-4:30PM

Prerequisites

Complex Variables I (or equivalent) and MATH-GA 1410 Introduction to Math Analysis I.

Topics

- Basic notions: Complex numbers, the complex plane, Riemann sphere, Möbius transformations (linear fractional transformations); Power series, differentiability of convergent power series.

- Complex derivatives: Analytic functions, Cauchy-Riemann equations, harmonic functions, conformal mappings.

- Cauchy integral theorem: Integration along curves, Cauchy integral formula

- Applications of Cauchy's theorem: Morera's theorem, Taylor series, Liouville's theorem, Maximum modulus theorem, open mapping theorem, Schwarz's lemma. Residue calculus, argument principle, Rouche's theorem (Fundamental theorem of algebra)

- Harmonic functions: mean value theorem, Poisson's formula, Schwarz's theorem, reflection principle

- Local properties of analytic functions: Taylor and Laurent series, poles, branch points, essential singularities

- Representations of holomorphic functions: Weierstrass and Mittag-Leffler theorems, Hadamard factorization theorem

- Riemann mapping theorem: normal families of functions, Montel's theorem, proof of Riemann mapping theorem, examples

- Analytic continuation, monodromy theorem, reflection principle

- Special functions: Gamma and Riemann ζ-functions. Integral representations of special functions

- Distribution of function values of entire functions*.

Textbooks

- *Complex Analysis (3rd edition)*, L. Ahlfors, (International Series in Pure and Applied Mathematics, 1979)

- *Complex Analysis*, E.M. Stein and R. Shakarchi (Princeton University Press, 2003)

Homeworks

There are weekly written homework assignments posted on NYU classes every Tuesday due to the next Tuesday at the beginning of the class. **No late assignments allowed.** One lowest score will be dropped.

Exams

There will be in-class written Midterm (**Tuesday, October 22**) and Final (**Thursday, December 12**) exams.

Grades

Your course score will be determined as the following weighted average

Midterm	30%
Homework	20%
Participation and Attendance	10%
Final Exam	40%

Policy on out-of-sequence exams and missed quizzes

We are only able to accommodate a limited number of out-of-sequence exams due to limited availability of rooms and proctors. For this reason, we may approve out-of-sequence exams in the following cases:

- A documented medical excuse.

- A University sponsored event such as an athletic tournament, a play, or a musical performance. Athletic practices and rehearsals do not fall into this category. Please have your coach, conductor, or other faculty advisor contact your instructor.

- A religious holiday.

- Extreme hardship such as a family emergency.

We will not be able to accommodate out-of-sequence exams, quizzes, and finals for purposes of more convenient travel, including already purchased tickets. Please note again the date of the final and plan your summer travel accordingly.

Scheduled out-of-sequence exams and quizzes (those not arising from emergencies) must be taken before the actual exam. Makeups must occur within one week of the regularly scheduled exam or quiz, otherwise a zero score will be given.

If you require additional accommodations as determined by the Center for Student Disabilities, please let your instructor know as soon as possible.

Academic Honesty

Guidelines regarding cheating and plagiarism are laid out in the Graduate School of Arts and Sciences guidelines and will be adhered to strictly. Collaboration is permitted, in fact encouraged, for home assignments; however, all submitted assignments must be written up independently and represent the student's own work and understanding. Furthermore, collaborations must be acknowledged at the top of the assignment, by naming the participants in it.