MATH 656: Complex Variables I
Spring 2023 Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: The theory and applications of analytic functions of one complex variable: elementary properties of complex numbers, analytic functions, elementary complex functions, conformal mapping, Cauchy integral formula, maximum modulus principle, Laurent series, classification of isolated singularities, residue theorem, and applications.

Number of Credits: 3

Prerequisites: MATH 545 or MATH 645 or departmental approval.

Course-Section and Instructors:

Course-Section	Instructor
Math 656-002	Professor T. P. Nguyen

Office Hours for All Math Instructors: Spring 2023 Office Hours and Emails

Textbook: Full notes for the course will be provided. A suggested supplementary reference text is:

Title	*Complex Variables: Introduction & Applications*
Author	M.J. Ablowitz and A.S. Fokas
Edition	2nd
Publisher	2nd Ed
ISBN #	ISBN-13: 978-0521534291; ISBN-10: 0521534291

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 3, 2023**. It will be strictly enforced.

COURSE GOALS

Course Objectives:

- Students gain a clear and deep understanding of the wide-ranging properties of analytic functions of a complex variable.
- Students learn and understand key theorems applicable to analytic functions, particularly the Integral Theorems, their corollaries and applications.
- Students learn key applications of the Cauchy Residue Theorem, including its use in calculating certain definite integrals, well as Fourier and Laplace Transform theory.
- Students gain practical knowledge of how complex analysis can be used in a range of applied mathematics and physics problems.

Course Outcomes:

- Students will be able to use and apply results from complex analysis to a range of problems in applied mathematics.
- Students will be prepared for the complex analysis portion of Part B of the written Qualifying Exam.
- Students will gain an understanding of the theory of functions of a complex variable.
- Students will be prepared for the next level of study in complex analysis and other areas of mathematics.

Course Assessment:

The assessment of objectives will be achieved through homework assignments and examinations testing the specific outcomes listed above.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework	25%
Project	10%
Midterm Exam	30%
Final Exam	35%

Your final letter grade will be based on the following tentative curve.

A	88 - 100	**C**	62 - 67
B+	82 - 87	**D**	55 - 61
B	75 - 81	**F**	0 - 54
C+	68 - 74		

Attendance: Attendance in class is mandatory. A couple missed lectures over the course of the semester will not impact your grade, but please don't miss class if you don't have to. You should inform your instructor in case you have to miss a class.

Email and Canvas: Regularly check your NJIT email account and the course information posted on Canvas for class assignments and announcements from your instructor.

Homework and Project: Homework and project assignments, as well as their due dates, will be posted on Canvas. Your work will be submitted on Canvas (NOT email). NO late submission will be accepted (rare exceptions may be made if there is good reason, but that must be approved by the instructor before the due date).

Exams: The midterm exam will be held at the regular class time as indicated in the detailed schedule below, proctored by the instructor.

Midterm Exam	March 10, 2023
Final Exam Period	May 5 - May 11, 2023

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for Instructor Office Hours and Emails.

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Scott Janz, Associate Director of Disability Support Services at 973-596-5417 or via email at scott.p.janz@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

https://www.njit.edu/accessibility/

Important Dates (See: Spring 2023 Academic Calendar, Registrar)

Date	Day	Event

January 17, 2023	Tuesday	First Day of Classes
January 23, 2023	Monday	Last Day to Add/Drop Classes
March 13, 2023	Monday	Spring Recess Begins
March 18, 2023	Saturday	Spring Recess Ends
April 3, 2023	Monday	Last Day to Withdraw
April 7, 2023	Friday	Good Friday - No Classes
May 2, 2023	Tuesday	Friday Classes Meet
May 2, 2023	Tuesday	Last Day of Classes
May 3 - May 4, 2023	Wednesday and Thursday	Reading Days
May 5 - May 11, 2023	Friday to Thursday	Final Exam Period

Tentative Course Outline

Lecture (date)	Sections	Topics
1 (1/17)	1.1, 1.2	Complex Numbers and Functions
2 (1/20)	1.2, 1.3	Complex Functions and Derivatives
3 (1/24)	2.1, 2.2	Analytic functions
4 (1/27)	2.3, 2.4	Analytic function and Integration
5 (1/31)	2.5, 2.6	Cauchy's Theorem and Formulas
6 (2/03)	2.6	Liouville, Morera and Maximum Modulus Theorem
7 (2/07)	3.1, 3.2	Series and Singularities for Complex Functions
8 (2/10)	3.2, 3.3	Taylor and Laurent Series
9 (2/14)	3.3, 3.4	Laurent Series and Singularities
10 (2/17)	3.4, 3.5	Singularities and Continuation
11 (2/21)	3.5, 3.7	Singularities and Painlevé Equation
12 (2/24)	3.7, 3.8	Computations and Applications for Singularities
13 (2/28)	3.8 + Notes	Computation Methods
14 (3/03)	Notes	More on Complex Functions and Computations
15 (3/07)		**Review for Midterm Exam**

16 (3/10)		**Midterm Exam**
3/13 - 3/18		**Spring Break**
17 (3/21)	4.1	Residue Calculus: Cauchy's Theorem
18 (3/24)	4.2,4.3	Application of Residue Theory: Definite Integrals
19 (3/28)	4.4	Applications of Residue Theory: Argument Principle and Rouché's Theorem
20 (3/31)	4.4, 4.5	More applications of Residue Theory
3th April	**Last Day to Withdraw**	
21 (4/04)	4.5, 4.6	Fourier and Laplace transform
7th April		**Good Friday - No class**
22 (4/11)	4.6	Application of Transforms to Differential Equations
23 (4/14)	5.1, 5.2	Conformal mappings and their inverses
24 (4/18)	5.3, 5.4	Conformal mappings and their applications
25 (4/21)	5.5, 5.6	Riemann mappings and Schwarz - Christoffel Theorems
26 (4/25)	5.1 - 5.6	Overview of Conformal mappings
27 (4/28)	Notes	More on Conformal mappings - Riemann mapping theorem
28 (5/02)	**Last Class: Review for Final Exam**	

Updated by Professor T. P. Nguyen - 1/12/2023
Department of Mathematical Sciences Course Syllabus, Spring 2023