

THE DEPARTMENT OF MATHEMATICAL SCIENCES

## MATH 332: Introduction to Functions of a Complex Variable

### *Fall 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.

Please be sure you read and fully understand our [DMS Online Exam Policy](#).

### COURSE INFORMATION

**Course Description:** Functions of a complex variable: Cauchy-Riemann equations, Cauchy-Goursat theorem, integration, series, residues, poles, geometrical aspects. Emphasis on techniques. Effective From: Fall 2010.

**Number of Credits:** 3

**Prerequisites:** [MATH 211](#) or [MATH 213](#) and [MATH 222](#) all with a grade of C or better

**Course-Section and Instructors:**

Course-Section	Instructor
Math 332-001	Professor E. Lushi

**Office Hours for All Math Instructors:** [Fall 2023 Office Hours and Emails](#)

**Required Textbook:**

Title	<i>Complex Variables and Applications</i>
Author	Brown
Edition	9th
Publisher	McGraw-Hill
ISBN #	978-0073383170

**University-wide Withdrawal Date:** The last day to withdraw with a W is [Monday, November 13, 2023](#). It will be strictly enforced.

## COURSE GOALS

### Course Objectives

- Understand the relevance and broad importance of the theory of analytic functions.
- Learn the meaning of theorems and corollaries describing important properties of analytic functions.
- Learn the connection between the series representations and integration properties of analytic functions.
- Learn applications of the Cauchy Residue Theorem, and its use in calculating certain definite integrals.
- Learn how to apply knowledge of analytic functions to problems in applied math, science and engineering.

### Course Outcomes

- Students gain knowledge of the theory of analytic functions of a complex variable, and its broad applicability.
- Students gain a deeper understanding of common elementary transcendental functions through the knowledge of their properties in the complex plane.
- Students are prepared for further study in more advanced mathematics, science and engineering courses.
- Students can apply their knowledge of the theory of analytic functions to solve problems in applied mathematics, fluid dynamics, electrodynamics, and other areas of science and engineering.

**Course Assessment:** The assessment of objectives is achieved through homework assignments, and in-class quizzes, midterm and final examinations.

## 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 and Quizzes: 20%	Midterm Exams: 30%	Final Exam: 50%
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A passing final letter grade will be based on the following tentative cutoffs:

A	90 - 100	C+	66 - 75
B+	82 - 89	C	58 - 65
B	74 - 81	D	50 - 57

**Attendance Policy:** Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the **Math Department's Attendance Policy**. This policy will be strictly enforced.

**Homework and Quiz Policy:** Homework problem sets will be posted on the **course canvas page** at the end of each week, based on the material covered that week. Late homework will not be accepted. Short quizzes will be given at the end of the class on Tuesdays based on the material covered in the previous week.

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

**Makeup Exam Policy:** There will be **NO MAKE-UP EXAMS** during the semester. If 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

**Math Tutoring Center:** Located in the Central King Building, Lower Level, Rm. G11 (See: **Fall 2023 Hours**)

**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 need an accommodation due to a disability, please contact the Office of Accessibility Resources and Services at [oars@njit.edu](mailto:oars@njit.edu), or visit Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is 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: **Fall 2023 Academic Calendar, Registrar**)

Date	Day	Event
September 4, 2023	Monday	Labor Day
September 5, 2023	Tuesday	First Day of Classes
September 11, 2023	Monday	Last Day to Add/Drop Classes
November 13, 2023	Monday	Last Day to Withdraw
November 21, 2023	Tuesday	Thursday Classes Meet
November 23 to November 26, 2023	Thursday and Saturday	Thanksgiving Recess - Closed
December 13, 2023	Wednesday	Last Day of Classes
December 14, 2023	Thursday	Reading Day 1
December 15, 2023	Friday	Reading Day 2
December 17 to December 23, 2023	Sunday to Saturday	Final Exam Period

## Course Outline

Date		Sections	Topic
September 05	1	1-5	Complex Algebra; Vectors & Moduli; Complex Conjugate
September 07	2	6-11	Polar Representation; Products & Powers in Exponential Form; Roots
September 12	3	12	Regions in the Complex Plane
September 14	4	13-14	Functions of Complex Variable; Mappings
September 19	5	15-18	Limits and Continuity
September 21	6	19-23	Derivatives & Analyticity; The Cauchy-Riemann Equations
September 26	7	24-26	Analyticity; Cauchy-Riemann Equations in Polar Coordinates, Harmonic
September 28	8	27-29	Functions; Uniquely Determined Functions; Reflection Principle
October 03	9	30-36	The Exponential and Logarithm, The Power Function
October 05	10	37-39	Trigonometric and Hyperbolic Functions
October 10	11	40	Inverse Trigonometric & Inverse Hyperbolic Functions
October 12	12	41-49	Contour Integrals; Fundamental Theorem of Calculus
October 17	13	50-53	The Cauchy-Goursat Theorem
October 19	14	54-56	The Cauchy Integral Formula
October 24	15		<b>MIDTERM</b>
October 26	16	57-59	The Extensions of the Cauchy Integral Formula
October 31	17	60-65	Taylor Series; Power Series Convergence
November 02	18	66-68	Laurent Series
November 07	19	69-71	Uniform Convergence; Integration & Differentiation of Power Series
November 09	20	72-73	Series Multiplication and Division
November 14	21	74-80	Cauchy's Residue Theorem, Zeros and Singularities
November 16	22	81-84	The Point at Infinity
November 21	23	85-87	Improper Integrals from Fourier Analysis
November 23	-	-	<b>No class - Thanksgiving Break</b>
November 28	24	88	Improper Integrals Continued, Jordan's Lemma
November 30	25	89-90	Integrals Involving Indented Contours
December 05	26	91	Integration along a Branch Cut
December 07	27	92	Definite Integrals Involving Sines and Cosines
December 12	28	<b>REVIEW FOR FINAL EXAM</b>	

Updated by Professor E. Lushi - 09/01/2023  
Department of Mathematical Sciences Course Syllabus, Fall 2023