

MA 42500/52500. ELEMENTS OF COMPLEX ANALYSIS (FALL 2026)

INSTRUCTOR: DI QI (EMAIL: QIDI@PURDUE.EDU)

Time: Mon., Wed., Fri. 2:30 - 3:20 PM, LILY G401

First Class: August 24, 2026

Last Class: December 11, 2026

For other important dates, see Purdue 2026-2027 Academic Calendar.

(see also *Course Webpage* for supplementary course materials)

COURSE DESCRIPTION:

The main objective of this course is to provide an elementary introduction to applied complex analysis. The course include roughly the following main topics: (i) fundamental properties of the complex number system, elementary topology on the complex plane, and elementary properties of complex functions; (ii) differentiation on the complex plane, analyticity and its consequences; (iii) contour integrals and Cauchy's theorems; (iv) Taylor and Laurent series of complex functions; (v) singularities of functions and residue calculus; and (vi) selected applications in computing Fourier transforms, estimating zeros of complex functions, and related topics if time permits.

Prerequisite: Students are expected to: (a) have strong background in integral and differential calculus of one- and multi-variable functions; (b) be familiar with basic concepts of analysis (such as convergence of sequences and series of real numbers, and $\epsilon - \delta$ characterization of continuity of real-valued functions).

Textbook: I will not use an official textbook, but accessible LaTeX lecture notes will be posted on *Brightspace* after the class. The following textbook is recommended, though I will not adhere to its exact order

- Mark J. Ablowitz and Athanassios S. Fokas, *Complex Variables: Introduction and Applications*, Second Edition, Cambridge University Press (recommended)
- Elias M. Stein and Rami Shakarchi, *Complex Analysis*, Princeton University Press
- Theodore W. Gamelin, *Complex Analysis*, Springer

MAJOR LEARNING OUTCOMES:

- (1) Complex numbers and complex-valued functions
- (2) Differentiation of complex functions
- (3) Power series and uniform convergence
- (4) Integration and contour integrals
- (5) Conformal mapping
- (6) Asymptotic evaluation of integrals
- (7) Riemann-Hilbert problems

LEARNING RESOURCES & COURSE ARRANGEMENTS:

Course Resources: The main learning management system will be *Brightspace*. Lecture notes and homework will be posted on *Brightspace*. The following platforms (accessible through *Brightspace*) will also be used for assignments submission and other activities:

- *Gradescope* for homework submission.

- *Piazza* for class discussions.
- *Zoom* for potential online discussions and virtual meetings.

Course Schedule:

Week	Dates	Topics (Sections in the textbook)	Homework Due	Comments
1	Aug. 24, 26, 28	Intro to Complex System		
2	Aug. 31, Sep. 2, 4	Elementary topology in complex system	HW1 due	
3	Sep. 9, 11	Elementary Complex Functions	HW2 due	No class on Sep. 7 (Labor Day)
4	Sep. 14, 16, 18	Continuity of Complex Functions	HW3 due	
5	Sep. 21, 23, 25	Complex Differentiation	HW4 due	
6	Sep. 28, 30, Oct. 2	Complex Integration		
7	Oct. 5, 7, 9	Review and Midterm I	HW5 due	
8	Oct. 14, 16	Cauchy's Integral Theorem		No class on Oct. 12 (Fall Break)
9	Oct. 19, 21, 23	Cauchy's Derivative Theorem	HW6 due	
10	Oct. 26, 28, 30	Maximum Modulus Principle	HW7 due	
11	Nov. 2, 4, 6	Analytic Continuation Principle		
12	Nov. 9, 11, 13	Review and Midterm II	HW8 due	
13	Nov. 16, 18, 20	Introduction to Power Series	HW9 due	
14	Nov. 23	Taylor and Laurent Series	HW10 due	No class on Nov. 25, 27 (Thanksgiving break)
15	Nov. 30, Dec. 2, 4	Residue Calculus	HW11 due	
16	Dec. 7, 9, 11	Review for Final	No HW due	Quiet Period
16	Dec. 14-19	Final exam week		

(Schedule is subject to change. Any changes will be posted on *Brightspace*.)

Lecture Notes: Lecture notes will be posted in *Brightspace* and will be organized in form of lecture modules (Lecture 1, Lecture 2, etc). Typically, there will be three lectures per week, each corresponding to a section in the textbook and about 50 mins long.

Office Hours: WF, 3:30 pm-4:30pm (Eastern Time) or through appointment. The time is subject to change. The information will be posted on *Brightspace*.

Homework: There will be 11 homework sets, each based on 100 points given weekly. The lowest score from your homework will be dropped automatically when calculating your final grade (in other words, 10 of your highest homework scores will be used in calculating your final grade for the class).

The homework should be submitted to *Gradescope* and graded by a grader. Your responses can either be handwritten or typed with LaTeX.

Note that you should always show your work of full solutions in the handwritten homework to receive credits. Feel free to discuss homework problems on piazza. But you have to write your own homework. The

homework problems are graded mainly on your reasoning. No points will be given if you only write the final answer.

Normally, homework will be due every **Sunday at 11:59pm**. Late homework will not be accepted, but one lowest score will be dropped in the final grading.

Exams: There will be two in-class Midterm Exams, tentatively in Week 7 and Week 12 and a Final Exam in the Finals Week (Dec. 14-19). We will have Review sessions before each exam. The exams may include partial credit problems.

AI use policy: The use of AI and LLMs (large-language models) is not permitted in this course for assessed work (such as homework submissions and class projects) and all the exams. The use of AI/LLMs for assessed work shall be considered cheating, with the following penalties:

- The first time a student turns in assessed work that was AI-generated, they will receive a zero on the assignment.
- The second time a student turns in assessed work that was AI-generated, they will be reported to the Office of the Dean of Students.

Students are allowed to use AI and LLMs for non-assessed work to help learning and understanding.

Grading: Your grade will be determined from the total score, whose components have the following maximum values:

Category	Max. Score
Homework	20
Midterm Exam I	20
Midterm Exam II	20
Final Exam	40
Total	100

This semester, we will apply the following rule: students who get at least 97% of the total points are guaranteed an A+, 93% guarantees an A, 90% an A-, 87% a B+, 83% a B, 80% a B-, 77% a C+, 73% a C, 70% a C-, 67% a D+, 63% a D, and 60% a D-. Please note, these are not the actual cutoffs, but rather upper bounds on those. The actual cutoffs of these grades will be determined after the final exam and can be lower but not higher than the ones above. Thus, the actual cutoff for A can be, say 85%, but not 95%.

COURSE AND UNIVERSITY POLICIES:

Attendance and course engagement: This is an in-person course. The students are expected to attend the lectures and read the corresponding lecture notes. Reading the sections in the textbook ahead of time is highly recommended. Students are responsible for completing and submitting all assignments on time. Students must take all exams at the scheduled times (see below for makeup policy). Students are encouraged to participate actively during the lectures and after-class discussions. Students must also check periodically for possible changes in the course schedule (on *Brightspace*) including due dates for assignments and exams.

Late homework: The lowest one homework score will be dropped, but in return, late homework will not be accepted. In the event that an assignment is missed for reasons that are serious, unavoidable, and beyond the student's control, the situation will be handled on an individual basis. Documentation may be required in such cases.

Makeup policy: Student needs to inform the instructor of any conflict that can be anticipated and will affect the submission of an assignment or the ability to take an exam. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflict, when advance notification to

an instructor is not possible, the student should contact the instructor as soon as possible by email, through *Brightspace*, or by phone. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via email or phone at 765-494-1747. Our course *Brightspace* includes a link on Attendance and Grief Absence policies under the University Policies menu.

Academic integrity: Academic integrity is expected for all students at all times in this course. You are free (even encouraged) to work with other students to solve the homework problems. However, you are required to complete and write up solutions for the homework using your own words and on your own. If you worked with any humans, book, the internet, you should be explicit about it and list all sources and the extent of help you got from each resource (no points will be taken for such disclosures). But if you present as your own work what was not, then you will get zero points on the assignment and an academic misconduct filing after the first instance. Of course, you are required to do your own work on each exam (although you can prepare with others).

Nondiscrimination statement: Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. More details are available on our course *Brightspace* table of contents, under University Policies.

Students with disabilities: Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247. In this mathematics course accommodations are managed between the instructor, the student and DRC Testing Center. If you have been certified by the Disability Resource Center (DRC) as eligible for accommodations, you should contact your instructor to discuss your accommodations as soon as possible. Here are instructions for sending your Course Accessibility Letter to your instructor: <https://www.purdue.edu/drc/students/course-accessibility-letter.php>.

Emergency preparation: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your *@purdue.edu* email on a frequent basis.

COVID-19 statement: If you become quarantined or isolated at any point in time during the semester, in addition to support from the Protect Purdue Health Center, you will also have access to an Academic Case Manager who can provide you academic support during this time. Your Academic Case Manager can be reached at acmq@purdue.edu and will provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email or *Brightspace*. We will make arrangements based on your particular situation. The Office of the Dean of Students (odos@purdue.edu) is also available to support you should this situation occur. Other important policies can be found in *Brightspace*.

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