

Syllabus for MA42500-002/MA52500-002  
Elements of Complex Analysis  
Fall 2025

1. COURSE DESCRIPTION

This is a basic course in Complex Analysis. The tentative list of topics is:

- Complex numbers, algebraic operations and geometric representations, exponential, powers and roots
- Convergence, subsets of the complex plane, Riemann sphere, limits and continuity
- Complex differentiation, Cauchy-Riemann conditions, harmonic functions
- Elementary functions and maps performed by them; rational, exponential trigonometric functions
- Powers and logarithms; branches of multi-valued functions
- Line integrals, primitives, Cauchy theorem
- Corollaries of Cauchy theorem: Cauchy inequalities, Liouville theorem, Fundamental theorem of algebra, existence of eigenvalues
- Morera's theorem, limits of analytic functions
- Power series, radius of convergence, expansion of an analytic function into a power series, Laurent series
- Classification of isolated singularities
- Residues and their applications to evaluation of integrals and summation of series; Argument Principle and Rouché's theorem
- Harmonic functions, Poisson integral, Dirichlet problem
- Conformal mappings and their application to the Dirichlet problems; methods of finding conformal mappings

**Prerequisites:** Calculus, Linear Algebra

2. LEARNING OUTCOMES

Students will master the part of complex analysis that is foundational for all of analysis, algebra, and geometry. Students will appreciate the beauty and power of the tools of complex analysis and will see that they are broadly applicable to many areas of Mathematics and Science. Upon completion of the course, students will be prepared to take advanced courses in real and complex analysis, including some at the graduate level.

3. COURSE INFORMATION

Time: MWF 10:30–11:20am  
Location: PHYS 110  
Course CRN: #32505/#32504  
Course Credits: 3  
Course Webpage: [here](#)

#### 4. INSTRUCTOR INFORMATION

Instructor: Sasha Tsymbaliuk

Email: [otsymbal@purdue.edu](mailto:otsymbal@purdue.edu) (emails will be responded within 24h Mon-Fri)

Office hours: MW 11:30am–12:30pm (Math Building 620) AND 1 flexible hour upon request

#### 5. TEXTBOOK

The material of this course is mostly based on the following book:

- “*Fundamentals of Complex Analysis with Applications to Engineering and Science*” (Third Edition) by E. Saff and A. Snider, Prentice Hall, 2003.

Most of the homework will consist of problems from this textbook.

#### 6. ASSIGNMENTS, EXAMS, AND GRADING SCALE

There will be weekly homework assignments to be collected through Brightspace, typically due at noon on Thur. Only half of problems will be graded by the grader (but you will not know which once and are supposed to solve all of them). Missed or late assignments can only be made up when you notify me ahead of time with a reasonable explanation and plan for completion. These requests will be accepted at my discretion.

There will be two evening midterms and a final exam. The dates, time and location TBC.

Your final grade will be computed by the scheme

$$\text{Final Score} = \frac{3}{11} \times \text{ME1} + \frac{3}{11} \times \text{ME2} + \frac{3}{11} \times \text{FE} + \frac{2}{11} \times \text{HW},$$

where FE, ME $i$ , HW are the scores (in %) for Final Exam, Midterm  $i$  (1 or 2), and Homework.

If you perform better than average on both midterm exams, you will be given an option of not taking the final exam and your score will be computed by an alternative scheme (to be specified towards the end of the course).

#### 7. GRADE CUTOFFS

Students who get at least 97% of the total points in this course 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-. For each of these, it's possible (and most probable) that at the end of the semester a somewhat lower percentage will be enough to get that grade.

#### 8. RESOURCES AND COLLABORATION

While solutions are often available online, please make every effort to solve problems yourselves (in case you had to look up for hints or solutions, please cite the source accordingly).

You are welcome to work together on homework problems, but you should work separately when you write them up. Working hard and independently on the homework is the best way to absorb the material and get the most out of the course. Taking shortcuts on the homework is certain to harm your performance in the course. You can use AI to explore mathematics, but you should not use it to do your homework.

## 9. ATTENDANCE

This course follows Purdue's academic regulations regarding attendance, which states that students are expected to be present for every meeting of the classes in which they are enrolled. When conflicts or absences 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. Purdue expects each student to be responsible for class-related work missed due to an unavoidable absence. Students should contact their instructors directly to discuss the absence and opportunity to complete missed coursework.

Do not come to class if you are feeling ill, but do email me with the subject line: Absence (no need to describe symptoms, but please notify you are feeling ill and cannot come to class).

## 10. DROP AND ADD CALENDARS

In accordance with the university policy, the course drop deadlines have been set at the end of week 13 (November 25 for Fall 2025). For other important dates, you can access the Drop/Add calendars by visiting:

<https://purdue.edu/registrar/calendars>

and scrolling down to locate the Drop/Add Refund & Deadline Calendars, or by following this direct link:

[https://catalog.purdue.edu/preview\\_program.php?catoid=18&poid=33633](https://catalog.purdue.edu/preview_program.php?catoid=18&poid=33633)

## 11. QUIET PERIOD

Per university regulations, the week preceding final exams (December 8–13, 2025) is designated as the Quiet Period. During this time, no assignments (including homework) can be assigned or collected, unless the course has no exams scheduled for the final exam week. Further details regarding this policy can be found at:

<https://catalog.purdue.edu/content.php?catoid=18&navoid=23275#c-quiet-period>

## 12. ACADEMIC ADJUSTEMENTS FOR 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 encouraged to contact the Disability Resource Center at: [drc@purdue.edu](mailto:drc@purdue.edu) or by phone: 765-494-1247, as soon as possible.

If the Disability Resource Center (DRC) has determined reasonable accommodations that you would like to utilize in this class, you must send your Course Accommodation Letter to the instructor. Instructions on sharing your Course Accommodation Letter can be found by visiting: <https://www.purdue.edu/drc/students/course-accommodation-letter.php>. Additionally, you are strongly encouraged to contact the instructor as soon as possible to discuss implementation of your accommodations.

### 13. NON-DISCRIMINATION

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.

### 14. MENTAL HEALTH/WELLNESS STATEMENT

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

### 15. ACADEMIC INTEGRITY

Because students have taken the official Purdue Honor Pledge, I expect there to be no academic dishonesty in this class. Students will not be asked to sign or repeat any similar statement again and I will treat you with the trust deserving of someone who has taken the pledge. However, I am required to mention in my syllabus material that Purdue policy states: *"Incidents of academic misconduct in this course will be addressed by the course instructor and referred to the Office of Student Rights and Responsibilities (OSRR) for review at the university level. Any violation of course policies as it relates to academic integrity will result minimally in a failing or zero grade for that particular assignment, and at the instructor's discretion may result in a failing grade for the course. In addition, all incidents of academic misconduct will be forwarded to OSRR, where university penalties, including removal from the university, may be considered"*

### 16. 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 via email.