



浙江大學

**MATH579**

**Advanced Complex Analysis**

# MATH579

## Advanced Complex Analysis

### Instructor Contact Details

Lecturer-in-charge: Xiaoguang WANG

Email: wlwyxy\_29@zju.edu.cn

Office location: Huajiachi Campus, Zhejiang University, Hangzhou, China

Consultation Time: Book appointment by sending email to: wlwyxy\_29@zju.edu.cn

### Teaching Times, Modes and Locations

Course Duration: 28 Jun 2026 to 17 Jul 2026

Modes: Face-to-face

Location: Huajiachi Campus, Zhejiang University via face-to-face

### Academic Level

Undergraduate

### Credit Points:

The course is worth 6 units of credit point.

### Credit Hours

The number of credit hours of this course equals to the credits of a standard semester- long course.

### Contact Hours

The course contains a total of 53 contact hours, which consists of orientation, lectures, seminars, quiz, discussion, research, case study, small tests, assignments, on-site field trip(s), in-class and after-class activities, revision, self-study, and final exam. Students will receive an official transcript which is issued by Zhejiang University when completing this course.

### Enrolment Requirements

Eligibility requires enrollment in an overseas university as an undergraduate or postgraduate student, proficiency in English, and pre-approval from the student's home institution.

### Course Description:

This advanced unit explores key topics in analytic function theory that combines broad applicability with mathematical elegance. Students will study conformal mappings, Riemann surfaces, contour integration, entire and analytic functions, the Riemann mapping theorem, analytic continuation, and special functions such as the Gamma and Zeta functions. Depending on the instructor's focus, further topics may include elliptic functions, Julia sets, functions of several complex variables, or complex manifolds. By the end of the course, students will acquire versatile tools to apply in mathematics, geometry, number theory, and advanced theoretical physics.

### Prerequisite:

N/A

### Learning Resources

- L.V. Ahlfors, *Complex Analysis: An Introduction to the Theory of Analytic Functions of One Complex Variable*, 3rd Edition, McGraw-Hill, 1979.
- J.B. Conway, *Functions of One Complex Variable I*, 2nd Edition, Springer, 1995.

### Learning Objectives

By the end of this course, you should be able to:

- Explain key concepts of complex analysis, including limits, continuity, differentiation, integration, and a range of advanced techniques, demonstrating both theoretical and applied understanding.
- Analyse and solve mathematical problems within the context of complex analysis by selecting suitable methods, evaluating alternative approaches, and effectively addressing challenges encountered.
- Construct clear, logically sound, and mathematically rigorous solutions to complex analysis problems, providing complete and appropriate justifications.
- Identify and model situations in mathematics, physics, engineering, and related fields that can be addressed through complex analysis and apply relevant techniques to obtain solutions.
- Integrate theoretical knowledge with computational skills to explore and interpret complex functions, mappings, and transformations.

### Course Delivery:

- Face-to-face Lecture mode includes lectures, seminars, quiz, discussion, research, case study, small tests, assignments, on-site field trip(s), in-class and after-class activities, revision, and final exam.

The following course will be taught in English. There will also be guest speakers and optional field trips available for students who would like to enhance their learning experience. All courses and other sessions will be run during weekdays.

### Topics and Course Schedule:

WK Topic Activities		
1	Complex numbers and basic operations	Lecture; Tutorial
1	Complex functions: definitions, examples, and basic properties	Lecture; Tutorial
1	Topology of the complex plane; conformal mappings – fundamentals	Lecture; Tutorial
1	Conformal mappings – advanced techniques and applications	Lecture; Tutorial
1	Complex integration: contours, paths, and Cauchy–Goursat theorem	Lecture; Tutorial
2	Cauchy's integral formula; properties of analytic and entire functions (Part 1)	Lecture; Tutorial
2	In-class Test	Closed book
2	Properties of analytic and entire functions (Part 2); Liouville's theorem	Lecture; Tutorial
2	The maximum modulus principle and related results	Lecture; Tutorial
2	Residue theory: poles, computation of residues, and the residue theorem	Lecture; Tutorial
3	Special topics: elliptic functions and applications in complex geometry	Lecture; Tutorial
3	Special topics: normal families and Julia sets	Lecture; Tutorial
3	Special topics: functions of several complex variables, complex manifolds	Lecture; Tutorial
3	Course review and advanced problem-solving workshop	Lecture; Tutorial
3	Revision	Tutorial
	Final exam	Closed book

Assessments:

Class participation	15%
In-class Test	15%
Assignments	20%
Final exam	50%

Pass Requirement (Double Pass Rule)

To pass this course, students are required to achieve:

- an overall mark of 50% or above, and
- a pass mark (50% or above) in the Final Examination.

Students who achieve an overall mark of 50% or above but do not achieve a pass in the Final Examination will receive a fail grade for the course.

Grade Descriptors:

HD	High Distinction	85-100
D	Distinction	75-84
Cr	Credit	65-74
P	Pass	50-64
F	Fail	0-49

### **High Distinction 85-100**

- Treatment of material evidences an advanced synthesis of ideas Demonstration of initiative, complex understanding, and analysis.
- Work is well-written and stylistically sophisticated, including appropriate referencing, clarity, and some creativity where appropriate.
- All criteria addressed to a high level.

### **Distinction 75-84**

- Treatment of material evidences an advanced understanding of ideas Demonstration of initiative, complex understanding and analysis Work is well-written and stylistically strong.
- All criteria addressed strongly.

### **Credit 65-74**

- Treatment of material displays a good understanding of ideas
- Work is well-written and stylistically sound, with a minimum of syntactical errors.
- All criteria addressed clearly.

### **Pass 50-64**

- Treatment of material indicates a satisfactory understanding of ideas Work is adequately written, with some syntactical errors.
- Most criteria addressed adequately.

### **Fail 0-49**

- Treatment of ideas indicates an inadequate understanding of ideas Written style inappropriate to task, major problems with expression.
- Most criteria not clearly or adequately addressed.

### Academic Integrity

Students are expected to uphold the university's academic honesty principles which are an integral part of the university's core values and principles. If a student fails to observe the acceptable standards of academic honesty, they could attract penalties and even disqualification from the course in more serious circumstances. Students are responsible for knowing and observing accepted principles of research, writing and any other task which they are required to complete.

Academic dishonesty or cheating includes acts of plagiarism, misrepresentation, fabrication, failure to reference materials used properly and forgery. These may include, but are not limited to: claiming the work of others as your own, deliberately applying false and inaccurate information, copying the work of others in part or whole, allowing others in the course to copy your work in part or whole, failing to appropriately acknowledge the work of other scholars/authors through acceptable referencing standards, purchasing papers or writing papers for other students and submitting the same paper twice for the same subject.

This Academic Integrity policy applies to all students of the Zhejiang University in all programs of study, including non-graduating students. It is to reinforce the University's commitment to maintain integrity and honesty in all academic activities of the University community.

### Policy

The foundation of good academic work is honesty. Maintaining academic integrity upholds the standards of the University. The responsibility for maintaining integrity in all the activities of the academic community lies with the students as well as the faculty and the University. Everyone in this community must work together to ensure that the values of truth, trust and justice are upheld.

Academic dishonesty affects the University's reputation and devalues the degrees offered. The University will impose serious penalties on students who are found to have violated this policy. The following penalties may be imposed:

- ✓ Expulsion
- ✓ Suspension
- ✓ Zero mark /fail grade
- ✓ Marking down
- ✓ Re-doing/re-submitting of assignments or reports, and
- ✓ Verbal or written warning