# Shanghai Jiao Tong University

## MA420 Complex Variable

| | | | |
|---|---|---|---|
| **Instructor Information** | Jin Zhang<br>Home Institution: Shanghai Maritime University<br>Email: zhj0314@hotmail.com<br>Office Hours: Determined by Instructor | | |
| **Term** | June 28, 2021<br>- July 23, 2021 | **Credits** | 4 units |
| **Class Hours** | Monday through Friday, 120 mins per teaching day | | |
| **Discussion Sessions** | 2.5 hours each week, conducted by teaching assistant(s) | | |
| **Total Contact Hours** | 66 contact hours (1 contact hour = 45 mins, 3000 mins in total) | | |
| **Required Texts (with ISBN)** | Complex Analysis (Princeton Lectures in Analysis II)<br>by Stein and Shakarchi<br>ISBN 978-0-691-11385-2 | | |
| **Prerequisite** | Multivariable Calculus, Real Analysis | | |
| The course might be moved to online delivery due to COVID-19 pandemic. Students will be notified once the decision is made. | | | |

**Course Overview**

The course will cover functions of a complex variable, Cauchy-Riemann equations, Cauchy's theorem and its consequences. Additional topics include uniform convergence on compacta, Taylor and Laurent series, open mapping theorem, Rouche's theorem, the argument principle, calculus of residues and conformal mappings.

**Course Goals**

By the end of course the student should be able to:

1. Show if a function is holomorphic.
2. Understand Cauchy's theorem and its consequences.
3. Find the Laurent series of a complex function.
4. Evaluate integrals using the residue theorem.
5. Find Conformal mappings between sets.

**Exams**

1 Midterm + 1 Final (closed book)

**Homework**

There will be 1 or 2 homeworks/week

**Grading Policy**

| | |
|---|---|
| Homework | 40% |
| Midterm | 20% |
| Final | 40% |

**Grading Scale**

| Number grade | Letter grade | GPA |
|---|---|---|
| 90-100 | A | 4.0 |
| 85-89 | A- | 3.7 |
| 80-84 | B+ | 3.3 |
| 75-79 | B | 3.0 |
| 70-74 | B- | 2.7 |
| 67-69 | C+ | 2.3 |
| 65-66 | C | 2.0 |
| 62-64 | C- | 1.7 |
| 60-61 | D | 1.0 |
| ≤59 | F (Failure) | 0 |

**Class Schedule**

| Date | Lecture | Readings |
|---|---|---|
| Day 1 | Introduction and preliminaries | 1.1 |
| Day 2 | Holomorphic functions and the Cauchy Riemann Equations | 1.2 |
| Day 3 | Contour integral and Cauchy's theorem | 2.1-2.3 |
| Day 4 | Application of Cauchy's theorem | 2.4-2.5 |
| Day 5 | Zeros, poles and the residue formula | 3.1-3.2 |
| Day 6 | Singularities and meromorphic functions | 3.3 |
| Day 7 | The argument principle | 3.4 |
| Day 8 | Homotopies and simply connected domains | 3.5 |
| Day 9 | The complex logarithm | 3.6 |
| Day 10 | Midterm | |
| Day 11 | The Fourier Transform | 4.1-4.3 |
| Day 12 | Jensen's formula and functions of finite order | 5.1-5.2 |
| Day 13 | Infinite products | 5.3-5.5 |
| Day 14 | Conformal equivalence | 8.1 |
| Day 15 | The schwarz lemma | 8.2 |
| Day 16 | The Riemann mapping theorem | 8.3 |
| Day 17 | Conformal mappings onto polygons | 8.4 |
| Day 18 | Special functions | 6.1-6.2, 7.1-7.2 |
| Day 19 | Review | |
| Day 20 | Final exam | |