



SYLLABUS

| Course Code | Course Num. | Course Name | Credit Hours | Lec. | Lab. | Tut. | Private study | Pre-requisites | Course Level | Teaching Language |
|-------------|-------------|------------------|--------------|------|------|------|---------------|----------------|----------------|-------------------|
| MAT | 312 | Complex Variable | 4 | 3 | 0 | 2 | 6 | MAT 311 | 6 ¹ | English |

A. Course Description

This course is an introduction to the theory of functions of a complex variable. Topics include complex numbers and their properties, Cauchy-Riemann equations and analytic functions, harmonic functions, Cauchy's theorem, integral representation formulae, power series of analytic functions, zeros, isolated singularities, Laurent series, poles, residues, use of residue calculus to evaluate real integrals, and conformal mapping.

B. Course Outcomes

At the end of this course the student will be able to:

- Study functions of one complex variable and perform a thorough investigation of the major theorems of complex analysis.
- Apply these ideas to a wide range of problems that include the evaluation of both complex line integrals and real integrals.
- To let students gain experience in dealing with axiomatic thinking and concise proofs of complex analysis.

C. References:

Required Textbook

An Introduction to Complex Analysis, R. P. Agarwal, K. Perera, S. Pinelas, Springer, 1st Edition, 2011.

Other references:

- *Complex Variables and applications*, R.V. Churchill and J.W. Brown, McGraw-Hill 5th Edition, 1989.
- *Complex Variables: Introduction and Applications*, M. Ablowitz et al, 2nd Edition, 2003.

Course Website: Google Classroom Webpage: <http://www.imamm.org/>

¹ B.Sc. in Applied Mathematics.



D. Topics Outline

- Basics:** Euler Formula and Exponential Form of a Complex Number, Basic Topological Properties, Functions of Complex Variables, Elementary Functions, Limits, Continuity and Uniform Continuity.
- Continuity And Differentiability:** Limits, Continuity and Uniform Continuity, Derivative of a Complex Function at a Point, Cauchy-Riemann Equations and Differentiability of Complex Functions, Derivatives of Elementary Functions, Analytic Function at a Point, Singular Points, Analytic Function and Harmonic Functions, Hopital's Rule.
- Complex Integral:** Line Integral and Complex Integral, Complex Form of Green's Theorem, Cauchy's and Cauchy-Goursat Theorems, Complex Indefinite Integral, Cauchy's Integral Formula, Argument, Rouche's, Liouville's, and Modulus Theorems.
- Complex Sequences and Series:** Basic Definitions, Tests of Series, Absolute Convergence, Power Series and Uniform Convergence, Circle of Convergence, Differentiation and Integration of Power Series, Taylor's Series and Laurent's Series. Type of Singular Points, Picard's Theorem.
- Residues:** Residues and the Residue Theorem with Applications.
- Basic concepts of conformal mapping.**

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

| | | |
|--|------------------------|-------------------------|
| Midterm 1: 20 % | Midterm 2: 20 % | Final Exam: 40 % |
| Quizzes, Homework, Attendance & Participation: 20 % | | |

The grading distribution:

| A ⁺ | A | B ⁺ | B | C ⁺ | C | D ⁺ | D | F |
|----------------|----------|----------------|----------|----------------|----------|----------------|----------|---------|
| [95, 100] | [90, 95) | [85, 90) | [80, 85) | [75, 80) | [70, 75) | [65, 70) | [60, 65) | [0, 60) |



G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](http://goo.gl/ykm7t3)
goo.gl/ykm7t3

