UNIVERSITY of NICOSIA

Course Code	Course Title	ECTS Credits
MATH-395	Complex Analysis	8
Department	**Semester**	**Prerequisites**
Computer Science	Fall, Spring	MATH-191
Type of Course	**Field**	**Language of Instruction**
Required	Mathematics	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	3rd	Dr Marios A. Christou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course*:*

The main objectives of the course are to:

- Familiarize students with the complex plane and complex functions
- Introduce the basic theory of conformal mapping and its applications to engineering problems.
- Cover the basic theory of complex integration in depth
- Provide students with knowledge of the theory of power series (Taylor and Laurent Series) and discuss its applications to residue integration and various problems in the field of Engineering
- Discuss Fourier series and integrals in detail
- Cover the Fourier transform and its inverse in depth.
- Familiarize students with the theory of Laplace and z-tranforms

Learning Outcomes:

After completion of the course students are expected to be able to:

1. Perform operations with complex numbers
2. Explain the concepts of differentiability and analyticity of complex functions and apply them to problems from complex function theory.
3. Apply the theory of conformal mapping to solve problems from various fields of engineering.
4. Compute complex integrals
5. Utilize the theory of complex integration and power series to solve problems from the area of residue calculus.
6. Apply Fourier series and transforms to differential and integral equations.
7. Implement Laplace and Z-transforms to solve problems in signal and systems theory

Course Contents:

1. The Complex number plane
    - Complex numbers and the complex plane

- Stereographic projection and the extended complex plane

2. Functions of a Complex variable
   - Functions and Limits
   - Differentiability , Analyticity and the Cauchy-Riemann conditions
   - Linear Fractional Transformations
   - Conformal mapping and its applications
3. Integration in the Complex plane
   - Line Integrals and the Definite Integral
   - Cauchy's Theorem and its implications
   - Cauchy formulas and the Maximum Modulus Principle
4. Power Series
   - Theory of sequences and infinite series
   - Power series and Laurent series
   - Elements from analytic continuation theory
5. Residue Calculus
   - The Residue theorem and evaluation of Real Integrals
   - The principle of the argument
   - Meromorphic and Entire functions
6. Fourier Series and Transforms
   - Fourier Series and the Fourier Integral Theorem
   - The Fourier Transform and its properties; Inverse Fourier Transforms
   - Solution of Differential equations using Fourier theory
7. Laplace and Z-transforms
   - The Laplace transform and its properties
   - Inversion of Laplace transforms
   - The solution of Differential Equations using Laplace Transform
   - Theory of Z-transform
   - Solution of Difference equations using Z-transform

Learning Activities and Teaching Methods:

Lectures, Exercises, Assignments and Tests.

Assessment Methods:

2 Mid-Term exams and a Final Exam.

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
E.Saff and A. Snider	Fundamentals of Complex Analysis with applications to Engineering, Science and Mathematics	Prentice Hall	2003	0139078746

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Churchill and Brown	Complex Variables and Applications 8th Edition.	McGraw Hill	2008	0073051942
Mersden and	Basic Complex	Freeman	1999	071672877X

Hoffman	Analysis, 3rd Edition	Publications		
Erwin Kreyszig	Advanced Engineering Mathematics 9th Edition	John Wiley and Sons	2006	0470084847