King Fahd University of Petroleum and Minerals
Department of Mathematics
SYLLABUS

Semester I, 2022-2023 (231)

(Instructor: Dr. Adel Khalfallah
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Course #: **Math 533**
Title: **Complex Variables**
Textbook: Complex Analysis, Ahlfors (3rd Edition)

Course description: Analytic functions. Cauchy's theorem and consequences. Singularities and expansion theorems. Maximum modulus principle. Residue theorem and its application. Compactness and convergence in spaces of analytic functions. Weierstrass and Mittag-Leffler representation theorems. Elementary conformal mappings.

Objectives:

1. Demonstrate accurate and efficient use of complex analysis techniques.

2. Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from complex analysis.

Wk	Chapters	Material
1	Chapter 1,2	The Algebra of Complex Numbers. Concept of Analytic Functions: Limits – Continuity – Analyticity.
2	Chapter 2	The Cauchy-Riemann Equations, Harmonic functions
3		The Exponential, Trigonometric and Logarithmic Functions.
4	Chapter 4	Fundamental Theorems

5		Cauchy's Integral Formula
6		Local Properties of Analytical Functions
7		General Form of Cauchy's Theorem
8		Calculus of Residues
9		Harmonic Functions
10	Chapter 5	Power Series Expansions
11		Partial Fraction and Factorization
12-13	Chapter 6	Conformal Mapping. Dirichlet's Problem
14-15	Presentations	

Evaluation Policy:

Major Exam I: 25 %

Major Exam II: 25 %

Final Exam : 35 %

Presentation 5%

Assignments: 10%

References

1) Conway, *Functions of One Complex Variable*, 2nd ed., Springer-Verlag, 1978
2) Ponnusamy and Silvermann, *Complex Variables with applications*, Birkhauser 2006
3) R.E. Greene, S.G. Krantz, *Function Theory of One Complex Variable*, AMS, 2001.
4) Elias M. Stein and R. Shakarchi, *Complex Analysis*, Princeton University Press, 2003