

King Fahd University of Petroleum and Minerals  
 Department of Mathematics & Statistics  
**SYLLABUS**  
 Semester I, 2015-2016 (151)  
 (Dr. Adel Khalfallah)

**Course #:** Math 533  
**Title:** Complex Variables I  
**Textbook:** Complex Analysis by Lars V. Ahlfors (Third Edition)

**Objective:** This course aims to strengthen the introductory concepts of complex analysis taken in the undergraduate course. By the end of this course, the student should have well understood the concepts of Analyticity of functions, complex integration, and get an idea about the conformal mappings.

**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 space of analytic and meromorphic functions. Elementary conformal mappings.

Wk	Date	Chapters	Material
1	Aug. 23-Aug 27	Chapter 1,2	The Algebra of Complex Numbers. Concept of Analytic Functions: Limits – Continuity – Analyticity.
2	Aug. 30-Sep.3	Chapter 2	The Cauchy-Riemann Equations, Harmonic functions
3	Sep. 6-10		The Exponential, Trigonometric and Logarithmic Functions.
4	Sep. 13-17	Chapter 4	Fundamental Theorems
5	Sep. 29-Oct.1		Cauchy's Integral Formula
6	Oct. 4-8		Local Properties of Analytical Functions
7	Oct. 11-15		General Form of Cauchy's Theorem
8	Oct. 18-22		Calculus of Residues
9	Oct. 25-29		Harmonic Functions
10	Nov. 1-5	Chapter 5	Power Series Expansions
11	Nov. 8-12		Partial Fraction and Factorization
12-13	Nov. 15- 26	Chapter 6	Conformal Mapping. Dirichlet's Problem
14-15	Nov. 29- Dec. 10	Presentations	
<b>Final Exam: December 20, 2015 (45%)</b>			

**Evaluation Policy:** Presentation and Assignments: 20%, Midterm Exam: 35%, Final 45%.

## **References**

- 1) Ponnusamy and Silvermann, *Complex Variables with applications*, Birkhauser 2006
- 2) E. Freitag, R. Busam, *Complex analysis*, Universitext, 2<sup>nd</sup> edition, 2009, Springer  
<http://www.springerlink.com/content/978-3-540-93982-5/>
- 3) T.W. Gamelin, *Complex Analysis*, Springer, 2001.
- 4) R.E. Greene, S.G. Krantz, *Function Theory of One Complex Variable*, AMS, 2001.
- 5) B.P. Palka, *An Introduction to Complex Function Theory*, Springer, 1991.
- 6) Elias M. Stein and R. Shakarchi, *Complex Analysis*, Princeton University Press, 2003