MATH 520 **COMPLEX ANALYSIS** **Spring 2016**

Text: Complex Analysis (Fourth Edition), by Serge Lang, published by Springer: Graduate Texts in Mathematics **103**. ISBN: 978-1-4419-3135-1 (Print) 978-1-4757-3083-8 (Online)

This text is available as an eBook through the USC library (free of charge when you login using your USC account). Also available through the USC library (follow the links for the eBook) is the opportunity to purchase a soft cover version for $24.99.

Syllabus: The course will cover the following material

CHAPTER I Complex Numbers and Functions. Sections §1-§7

CHAPTER II Power Series. Sections §1-§7.

CHAPTER III Cauchy's Theorem, First Part. Sections §1-§7. (Skip §4 and §5 first time through.)

CHAPTER IV Winding Numbers and Cauchy's Theorem. Sections §1-§2.

CHAPTER V Applications of Cauchy's Integral Formula. Sections §1-§3.

CHAPTER VI Calculus of Residues. Sections §1-§2.

CHAPTER VII Conformal Mappings. Sections §1-§5.

CHAPTER VIII Harmonic Functions. Sections §1-§5.

CHAPTER IX Schwarz Reflection. Sections §1-§3.

CHAPTER X The Riemann Mapping Theorem. Sections §1-§3.

CHAPTER XI Analytic Continuation Along Curves. Section §1.

CHAPTER XV The Gamma and Zeta Functions. Brief discussion only.

Notes: (1) Most authors use the terms "analytic" and "holomorphic" interchangeably. But for the first 126 pages of Lang we have to be more careful. Lang uses "holomorphic" to mean (once complex) differentiable (page 30), and "analytic" to mean that the function has a local power series expansion (page 68). It is easy to prove that analytic implies holomorphic, and in Chapter III Theorem 7.2 it is shown that holomorphic implies analytic. Thus from page 127 onwards (but not before!) the terms can be used interchangeably.

(2) As prerequisites, I will assume knowledge of basic facts about the complex numbers $\mathbf{C}$ (Chapter 1 Sections §1 and §2) and about limits, continuity, and open, closed and compact sets in $\mathbf{R}^2 \cong \mathbf{C}$ (Chapter 1 Section §4).