Spring 2015 Course Syllabus: Math 656 - 002

Course Title:	**Complex Variables I**
Textbook:	**Complex Variables**, M. Ablowitz & A. Fokas + Notes
Prerequisites:	Math 545 or Math 645
Website:	http://web.njit.edu/~matveev/M656_S15/

Course Objectives

- Gain deep understanding of the wide-ranging properties of analytic functions of a complex variable.
- Learn key theorems applicable to analytic functions, in particular the Integral Theorems and their corollaries.
- Learn key applications of the Cauchy Residue Theorem, in particular its use in calculating certain definite integrals.
- Learn how to apply the knowledge of analytic functions to problems in fluid flow and electrostatics.

Course Outcomes

- Students gain deeper knowledge of the theory of a function of complex variable.
- Students are prepared for further study in more advanced applied mathematics courses.
- Students are prepared for the Complex Analysis part of the Ph.D. Qualifying Examination at NJIT and other Ph.D.-granting Universities.
- Students can apply the theory of analytic functions to solve problems in applied mathematics, fluid dynamics and electrodynamics.

Course Assessment

- The assessment of objectives is achieved through homework assignments, and the in-class midterm and final examinations.

COURSE OUTLINE			
Lect.	**Sections**	**Topic**	**Assignment**
1/20	1.1	Complex Numbers and Their Properties	Select Probs.
1/23	1.2	Elementary Functions and Stereographic Projection	Select Probs.
1/27	1.3, 1.4	Limits, Continuity, Analyticity	Select Probs.
1/30	1.4, 2.1	Analytic Functions	Select Probs.
2/3	2.1	Analytic Functions	Select Probs.
2/6	2.1, 2.2	Multivalued Functions	Select Probs.
2/10	2.2	Multivalued Functions	Select Probs.
2/13	2.3	Multivalued Functions and Riemann Surfaces	Select Probs.
2/17	2.4	Complex Integration	Select Probs.
2/20	2.4, 2.5	Complex Integration and Cauchy's Theorem	Select Probs.
2/24	2.5, 2.6	Cauchy's Theorem and Cauchy's Integral Formula	Select Probs.
2/27	2.6	Extended Cauchy's Integral Formula	Select Probs.
3/3	2.6	Liouville, Morera and Maximum Modulus Theorems	Select Probs.
3/10	**Review for Midterm Exam**		
3/13	**MIDTERM EXAM: March 13, 2015**		
3/14-22	**Spring Recess**		
3/24	3. 1	Complex Series and Basic Properties	Select Probs.
3/27	3.2	Taylor Series	Select Probs.
3/31	3.3	Laurent Series	Select Probs.
4/3	3.4	Theoretical Results for Series	Select Probs.
4/7	3.5	Singularities, Analytic Continuation, and Natural Boundaries	Select Probs.

4/10	3.6	Infinite Products and Mittag-Leffler Expansions	Select Probs.
4/14	4.1	Cauchy Residue Theorem	Select Probs.
4/17	4.2	Applications: Evaluation of Improper Definite Integrals	Select Probs.
4/21	4.2	Applications: Evaluation of Certain Definite Integrals	Select Probs.
4/24	4.3	Applications: Integrals with Branch Points	Select Probs.
4/28	4.4	The Argument Principle and Rouche's Theorem	Select Probs.
5/1	4.4	The Argument Principle and Rouche's Theorem	Select Probs.
5/5	**Review for FINAL EXAM**		

IMPORTANT DATES	
FIRST DAY OF SEMESTER	January 20, 2015
MIDTERM EXAM	March 13, 2015
LAST DAY TO WITHDRAW	March 30, 2015
LAST DAY OF CLASSES	May 5, 2015
FINAL EXAM PERIOD	May 8-14, 2015

Grading Policy

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Assignment Weighting	
Homework	26 %
Midterm Exam	32 %
Final Exam	42 %
TOTAL	100%

Tentative Grading Scale	
A	88 -- 100
B+	82 -- 87
B	75 – 81
C+	68 – 74
C	62 – 67
D	55 – 61
F	0 – 54

Prepared by Prof. Victor Matveev, January 5, 2015