Philadelphia University
Department of Basic Sciences and Mathematics

First Semester | **Course Syllabus** | **2014/2015**

Course Title	Complex Analysis
Course Code	250312
Lecturer	Dr. Jadallah Rezqallah
Office Room	906 S (Ext. 2405)
Office Hours	Sun, Tue, Thu: 12:00 − 13:00 and Mon, Wed: 11:30 − 12:30
E−mail	jrezqallah@philadelphia.edu.jo

Course Description

This course is intended to familiarize the students with the basic concepts, principles, and methods of complex analysis and its applications. The course covers the following subjects: the complex numbers system, polar representation and complex root analytic functions, power series, Mobius transformation, conformal mapping, complex integration, power series representation of analytic functions, residues, Cauchy's theorem, application to integration simple closed curves, Cauchy's integral formula, Morera's theorem, singularities, classification and remainder.

Topics by the Week

Week	Topics
1+2	**Complex Numbers:** Sums and Products. Basic Algebraic Properties. Further Properties. Moduli. Complex Conjugates. Exponential Form. Products and Quotients in Exponential Form. Roots of Complex Numbers. Examples.
3+4+5	**Analytic Functions:** Functions of a Complex Variable. Mappings. Mappings by the Exponential Function. Limits. Theorems on Limits. Limits Involving the Point at Infinity. Continuity. Derivatives. Differentiation Formulas. Cauchy−Riemann Equations. Sufficient Conditions for Differentiability. Polar Coordinates. Analytic Functions. Examples. Harmonic Functions. Uniquely Determined Analytic Functions.
6+7	**Elementary Functions:** The Exponential Function. The Logarithmic Function. Branches and Derivatives of Logarithms. Some Identities Involving Logarithms. Complex Exponents. Trigonometric Functions. Hyperbolic Functions. Inverse Trigonometric and Hyperbolic Functions.
8+9+10	**Integrals:** Derivatives of Functions $w(t)$. Definite Integrals of Functions $w(t)$. Contours. Contour Integrals. Examples. Upper Bounds for Moduli of Contour Integrals. Antiderivatives. Examples. CauchyGoursat Theorem. Simply and Multiply Connected Domains. Cauchy Integral Formula. Derivatives of Analytic Functions. Liouville's Theorem and the Fundamental Theorem of Algebra. Maximum Modulus Principle.
11+12	**Series:** Convergence of Sequences. Convergence of Series. Taylor Series. Examples. Laurent Series. Examples. Absolute and Uniform Convergence of Power Series. Continuity of Sums of Power Series. Integration and Differentiation of Power Series. Uniqueness of Series Representations. Multiplication and Division of Power Series.

13+14+15	**Residues and Poles:** Residues. Cauchy's Residue Theorem. Using a Single Residue. The Three Types of Isolated Singular Points. Residues at Poles. Examples. Zeros of Analytic Functions. Zeros and Poles. Behavior of f Near Isolated Singular Points.
16	Final Exams.

Course Objectives The course objective is to understand, derive, prove, and apply the theory and properties of complex numbers.

Assessment Distribution

Students will be assessed based on a 100 total marks, which are distributed as follows.

Exam Type	Expected Time	Points Allocated
First	19/11/2014 - 27/11/2014	20%
Second	28/12/2014 - 06/01/2015	20%
Quizzes	3 quizzes (at least)	20%
Final	01/02/2015 - 09/02/2015	40%

Textbook and Supporting Materials

– James Ward Brown, Ruel V. Churchill, **Complex Variables and Applications, 7th Edition**, McGraw-Hill.

– Dennis G. Zill and Patrick Shanahan, **A First Course in Complex Analysis With Applications, 2nd Edition**, Jones & Bartlett Publishers 2008.

Class Attendance

Attendance is expected of every student. Being absent is not an excuse for not knowing about any important information that may have been given in class. Under the University's regulations, a student whose absence record exceeds 15% of total class hours will automatically fail the course. Students who in any way disrupt the class will be expelled from the classroom and will not be allowed to return until the problem has been resolved.

Late Exams

Late (make-up) exams will be given only to students who have a valid excuse and are able to provide a written document for its verification. The level of difficulty of a late exam is about 50% higher than that of the corresponding regular exam. All late exams will be conducted during the last week of the semester. Each student is allowed only one make-up in a semester, either for the first exam or the second, but not both. There is no make-up for a late exam.