Course Objectives:

1. To introduce students to the Complex Number System.
2. To equip students with necessary knowledge and skills to enable them handle mathematical operations, analyses and problems involving complex numbers.

18BSM503 Complex analysis										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	--	4	4	25	50	25	--	--	100

UNIT I **9 hours**

Introduction to complex number, Algebra of complex numbers, Functions of a complex variable, differentiability and analyticity, Cauchy Riemann Equations, Power series as an analytic function, Properties of line integrals.

UNIT II **10 hours**

Goursat Theorem, Cauchy theorem, consequence of simply connectivity, index of a closed curve, Cauchy's integral formula, Morera's theorem, Liouville's theorem, Fundamental theorem of Algebra, Harmonic functions, Existence of Harmonic conjugate.

UNIT III **10 hours**

Taylor's theorem, Zeros of Analytic functions, Laurent series, singularities, classification of singularities, Cauchy Residue theorem.

UNIT IV **10 hours**

Maximum modulus theorem, Minimum modulus theorem, Calculation of residues, Residue theorem, Evaluation of integrals of the form $\int_{\alpha}^{\alpha+2} R(cos\theta, sin\theta)d\theta$, $\int_{-\infty}^{\infty} f(x)\,dx$, Bilinear transformation, Conformal mappings.

APPROXIMATE TOTAL 39 Hours

Text and Reference books

1. Complex Analysis (Third edition) by L. V. Ahlfors, McGraw Hill Book Company,1979
2. Complex Analysis by J. B. Conway, Narosa Publishing House
3. Complex Analysis by Serg Lang, Addison Wesley
4. Foundations of Complex analysis (Second Edition), S. Ponnusamy, Narosa Publishing House.
5. Complex variables and Applications (Seventh edition) by James Ward Brown and Ruel V. Churchill, McGraw Hill.

Course Outcomes:

On completion of this course students will be expected to

1. Justify the need for a Complex Number System and explain how is related to other existing number systems.
2. Define a function of complex variable and carry out basic mathematical operations with complex numbers.
3. Apply the Cauchy Riemann Equation and use it to show that a function is analytic.
4. Define singularities of a function, know the different types of singularities, and be able to determine the points of singularities of a function. Apply Cauchy residue theorem.
5. Explain the concept of transformation in a complex space (linear and non-linear) and sketch associated diagrams.
6. Understand the concept of sequences and series with respect to the complex numbers system and establish whether a given series/ sequences is convergent/ divergent at a specified point or interval.
7. Use bilinear transformation and apply conformal mappings.