**Bharati College**

**(University of Delhi)**

Janak Puri, Delhi- 100058 [www.bharaticollege.du.ac.](http://www.bharaticollege.du.ac.)in

Lesson Plan (CORE, Semester I, July to November 2022)

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| **Name of Teacher** | Dr. Anubha Bhargava | | **Department** | | Mathematics |
| **Course** | B.Sc (H) Maths | | **Semester** | | FIFTH |
| **Paper** | Complex Analysis  Paper Code: ------------ | | **Academic Year** | | 2022-23 |
| **Learning Objectives** | | | | | |
| This course aims to introduce the basic ideas of analysis for complex functions in complex variables with visualization through relevant practical. Emphasis has been laid on Cauchy’s theorems, series expansions and calculation of residues. | | | | | |
| **Learning Outcomes** | | | | | |
| On successful completion of this course, the student will be able to:   1. Learn the significance of differentiability of complex functions leading to the understanding of Cauchy−Riemann equations. 2. Learn some elementary functions and valuate the contour integrals. 3. Understand the role of Cauchy−Goursat theorem and the Cauchy integral formula. 4. Expand some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals. | | | | | |
| **Lesson Plan** | | | | | |
| ***Week No.*** | | **Theme/ Curriculum** | | ***Any Additional Information*** | |
| Week 1-2  Week 3-4 | | : Functions of complex variable, Mappings, Mappings by the exponential function. : Limits, Theorems on limits, Limits involving the point at infinity, Continuity.  Derivatives, Differentiation formulae, Cauchy-Riemann equations, Sufficient conditions for differentiability. Analytic functions, Examples of analytic functions, Exponential function | | Allocation of Assignment I(Last Date 20th September 2023) | |
| Week 5 – 6  Week 7-8  Week 9-10 | | Logarithmic function, Branches and Derivatives of Logarithms, Trigonometric functions. Derivatives of functions, Definite integrals of functions, Contours.  Contour integrals and its examples, upper bounds for moduli of contour integrals. Antiderivatives, proof of antiderivative theorem.  State Cauchy−Goursat theorem, Cauchy integral formula. An extension of Cauchy integral formula, Consequences of Cauchy integral formula, Liouville’s theorem and the fundamental theorem of algebra. | | Test Scheduled | |
| Week 11-12  Week 13-14 | | Convergence of sequences, Convergence of series, Taylor series, proof of Taylor’s theorem, Examples. Laurent series and its examples, Absolute and uniform convergence of power series, uniqueness of series representations of power series  Isolated singular points, Residues, Cauchy’s residue theorem, Residue at infinity.  Types of isolated singular points, Residues at poles and its examples. | | Allocation of Assignment II | |
| **References:**  1. Brown, James Ward, & Churchill, Ruel V. (2014). Complex Variables and Applications (9th ed.). McGraw-Hill Education. New York | | | | | |