

Module Code: MATH-309  
Module Title: **Complex Analysis - II**  
Module Rating: 3 Cr. Hours

### **Singularity and Poles**

- Review of Laurent series
- Zeros, singularities
- Poles and residues

### **Contour Integration**

- Cauchy's residue theorem
- Applications of Cauchy's residue theorem

### **Expansion of Functions and Analytic Continuation**

- Mittag-Leffler theorem
- Weierstrass's factorization theorem
- Analytic continuation

### **Elliptic Functions**

- Periodic functions
- Elliptic functions and its properties
- Weierstrass function  $\wp(z)$
- Differential equation satisfied by  $\wp(z)$
- Integral formula for  $\wp(z)$
- Addition theorem for  $\wp(z)$
- Duplication formula for  $\wp(z)$
- Elliptic functions in terms of Weierstrass function with the same periods
- Quasi periodic functions: The zeta and sigma functions of Weierstrass
- Jacobian elliptic functions and its properties

### **Recommended Books**

1. H. S. Kasana, *Complex Variables: Theory and Applications*, (Prentice Hall, 2005)
2. M. R. Spiegel, *Complex Variables*, (McGraw Hill Book Company, 1974)
3. Louis L. Pennisi, *Elements of Complex Variables*, (Holt, Linehart and Winston, 1976)
4. W. Kaplan, *Introduction to Analytic Functions*, (Addison-Wesley, 1966)
5. E. D. Rainville, *Special Functions*, (The Macmillan Company, New York, 1965)
6. E. T. Whittaker and G. N. Watson, *A Course of Modern Analysis*, (Cambridge University Press, 1958)



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