

- (a) Geometric Distribution.
  - (b) Multinomial Distribution.
  - (c) Rectangular Distribution
  - (d) Gamma Distribution
  - (e) Beta Distribution.
  - (f) Exponential Distribution.
  - (g) Weibull Distribution.
  - (h) Logistic Distribution.
  - (i) Cauchy Distribution.
7. Lack of memory property of Exponential Distribution.

**Practical work to be conducted using electronic spreadsheet / EXCEL/ Statistical Software Package/ SPSS.**

#### **ESSENTIAL READINGS**

- Gupta, S. C. and Kapoor, V. K. (2020). Fundamentals of Mathematical Statistics, Twelfth Edition, Sultan Chand and Sons, Delhi.
- Ross, Sheldon M. (2013): A First Course in Probability, Ninth Edition, Pearson.
- Miller, I. and Miller, M. (2006). John E. Freund's Mathematical Statistics with Applications, Eight Edition., Pearson Education, Asia.
- Mood, A.M. Graybill, F.A. and Boes, D.C. (2007). Introduction to the Theory of Statistics, Third Edition, (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

#### **SUGGESTED READINGS**

- Rohatgi, V. K and Saleh M. E. (2015). An Introduction to Probability and Statistics, Third Edition, John Wiley and Sons, Inc., New Jersey.
- Hogg, R.V., Tanis, E.A. and Rao, J.M. (2009). Probability and Statistical Inference, 7th Ed., Pearson Education, New Delhi.
- Ross, Sheldon M.(2009). Introduction to Probability and Statistics for Engineers and Scientists, Fourth Edition, Academic Press.

**Note: Examination scheme and mode shall be as prescribed by the Examination Branch University of Delhi, from time to time.**

### **DISCIPLINE SPECIFIC CORE COURSE – 9: MATHEMATICAL ANALYSIS**

#### **CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Mathematical Analysis	4	3	0	1	Class XII with Mathematics	Nil

#### **Learning Objectives**

The learning objectives include:

- To study Real Analysis, which deals with the analytical properties of real functions and sequences.
- To study Numerical Analysis, which is the study of algorithms that use numerical approximation for the problems of mathematical analysis.

### **Learning Outcomes:**

After successful completion of this course, students should be able to:

- Understand the fundamental properties of real numbers and real-valued functions.
- Understand the Analytical properties of sequences.
- Apply Infinite series, their properties and different tests.
- Apply limits, continuity, differentiability, and mean value theorems.
- Use the fundamentals of numerical analysis, interpolation, numerical integration and difference equation.

## **SYLLABUS OF DSC-9**

### **Theory**

#### **UNIT I**

**(10 hours)**

##### **Set Theory and Sequences**

Completeness: The Completeness property of  $\mathbb{R}$ ; Archimedean property in  $\mathbb{R}$ ; Neighbourhood and limit points: Neighbourhood, Open Set, Closed Set, Supremum and Infimum, Limit Point of a Set; Sequences: Definition of a Sequence, Convergent Sequence, Divergent Sequence, Oscillatory Sequence, Cauchy Sequence, Monotone Sequence.

#### **UNIT II**

**(10 hours)**

##### **Series**

Infinite series, positive termed series and their convergence, Comparison test, D'Alembert's ratio test, Cauchy's  $n^{\text{th}}$  root test, Raabe's test. Gauss test, Cauchy's condensation test and integral test (Statements and Examples only). Absolute convergence of series, Conditional convergence.

#### **UNIT III**

**(10 hours)**

##### **Limit and Continuity**

Review of limit, continuity and differentiability, uniform Continuity and boundedness of a function. Rolle's and Lagrange's Mean Value theorems. Taylor's theorem with Lagrange's and Cauchy's form of remainder (without proof). Taylor's and Maclaurin's series expansions of  $\sin(x)$ ,  $\cos(x)$ ,  $\log(1+x)$ .

#### **UNIT IV**

**(15 hours)**

##### **Numerical Methods**

Factorial, finite differences and interpolation. Operators, E and divided difference. Newton's forward, backward and divided differences interpolation formulae. Lagrange's interpolation formulae. Gauss and Stirling interpolation formulae. Numerical integration. Trapezoidal rule, Simpson's one-third rule, three-eighths rule, Stirling's approximation to factorial  $n$ . Solution of difference equations of first order, Euler Maclaurin's summation formula.

### **PRACTICAL/LAB WORK – (30 hours)**

#### **List of Practical:**

##### **Practicals based on:**

1. Formation of difference table, fitting of polynomial and missing terms for equal interval of differencing.
2. Newton's Gregory forward difference interpolation formula.

3. Newton's backward difference interpolation formula.
4. Newton's divided difference and Lagrange's interpolation formula.
5. Gauss forward, Gauss backward central difference interpolation formula.
6. Stirling's central difference interpolation formula.
7. Lagrange's Inverse interpolation formula.
8. Method of successive approximation or iteration.
9. Method of reversion of series.
10. Trapezoidal Rule, Simpson's one-third rule, Simpson's three-eighth rule, Weddle's rule.
11. Euler-Maclaurin summation formula

**Practical work to be conducted using electronic spreadsheet / EXCEL/ Statistical Software Package/ SPSS/ calculators.**

### **ESSENTIAL READINGS**

- Appostol, T.M. (1987). Mathematical Analysis, 2nd Ed., Narosa Publishing House, New Delhi
- Ghorpade, S.R. and Limaye, B.V. (2006). A Course in Calculus and Real Analysis, Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint.
- Sastry, S.S. (2000). Introductory Methods of Numerical Analysis, 3rd Ed., Prentice Hall of India Pvt. Ltd., New Delhi.

### **SUGGESTIVE READINGS:**

- Bartle, R.G. and Sherbert, D.R. (2002). Introduction to Real Analysis, (3rd Ed.), John Wiley and Sons (Asia) Pte. Ltd., Singapore.
- Jain, M.K., Iyengar, S.R.K. and Jain, R.K. (2003). Numerical methods for scientific and engineering computation, New age International Publisher, India.
- Malik, S.C. and Arora, S. (1994). Mathematical Analysis, Second Edition, Wiley Eastern Limited, New Age International Limited, New Delhi.
- Mukherjee, Kr. Kalyan (1990). Numerical Analysis. New Central Book Agency.
- Narayan, S. (1987). A course of Mathematical Analysis, 12th revised Ed., S. Chand & Co. (Pvt.) Ltd., New Delhi.
- Somasundram, D. and Chaudhary, B. (1987). A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi.

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