



# DHRUBA CHAND HALDER COLLEGE

( FORMERLY DAKSHIN BARASAT COLLEGE )

ESTD. – 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P. O. Dakshin Barasat • Dist. South 24-Parganas • West Bengal • Pin 743372

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Ref. No. ....

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## Department of Mathematics Programme Specific Outcomes(PSOs)

**PSO1-** Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

**PSO2-** Create mathematical ideas from basic axioms.

**PSO3-** Students will possess basic subject knowledge required for advanced studies and research in pure and applied mathematics and statistics, professional and applied courses like Management Studies, Law etc.

**PSO4-** Understand, formulate and use quantitative models arising in social science, business and other contexts.

**PSO5-** Student is equipped with mathematical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.

## Course Outcomes

### Semester I:

1. a) Calculus-Geometry-Vector Analysis (MTMA CC1, CO1): To make students understand the limit concepts, equation of plane and vector equations.  
b) Calculus-Geometry-Vector Analysis (MTMA CC1, CO2): To discuss the Cauchy's principle, straight lines in 3D and triple product.  
c) Calculus-Geometry-Vector Analysis (MTMA CC1, CO3): To solve problems by Cauchy's theorem, learn about conics, limit and continuity of vector functions.

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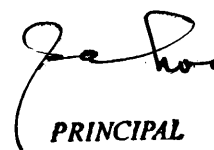
2. **a)** Algebra (MTMA CC2, CO1): To make students understand the mapping and relation of functions.
- b)** Algebra (MTMA CC2, CO2): To discuss the various types of functions and relation.
- c)** Algebra (MTMA CC2, CO3): To solve problems using set theoretic operations.

### **Semester II:**

1. **a)** Real Analysis (MTMA CC3, CO1): To make students understand the concept of real number line.
  - b)** Real Analysis (MTMA CC3, CO2): To discuss the G.L.B. properties and sequence of functions.
  - c)** Real Analysis (MTMA CC3, CO3): To solve problems by applying convergence theorem.
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2. **a)** Group Theory- I(MTMA CC4, CO1): To make students understand the concept of group and sub groups.
  - b)** Group Theory- I(MTMA CC4, CO2): To discuss the cyclic group, their classifications, and Lagrange's theorem.
  - c)** Group Theory- I(MTMA CC4, CO3): To solve problems using Lagrange's theorem.

### **Semester III:**

1. **a)** Theory of real functions(MTMA CC5, CO1): To make students understand continuity of a function on an interval.
  - b)** Theory of real functions(MTMA CC5, CO2): To discuss the important theorems like Rolle's Theorem, Darboux theorem, L' Hospital's rule etc.
  - c)** Theory of real functions(MTMA CC5, CO3): To solve problems using Rolle's theorem & L' Hospital's Rule.
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2. **a)** Ring Theory & Linear Algebra-I(MTMA CC6, CO1): To make students understand the definition and properties of rings, vector spaces and geometric significance of subspace.
  - b)** Ring Theory & Linear Algebra-I(MTMA CC6, CO2): To discuss the different isomorphism theorems, Cayley-Hamilton theorem.
  - c)** Ring Theory & Linear Algebra-I(MTMA CC6, CO3): To solve the problems by using Cayley-Hamilton theorem.
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3. **a)** Ordinary Differential Equation & Multivariate Calculus I(MTMA CC7, CO1): To make students understand the chain rule, exact differential equation, Clairaut's equation and singular solution.




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- b)** Ordinary Differential Equation & Multivariate Calculus I(MTMA CC7, CO2): To discuss the linear equations and Bernoulli equations, method of Lagrange multipliers.
- c)** Ordinary Differential Equation & Multivariate Calculus I(MTMA CC7, CO3): To solve problems using Bernoulli equations.
4. **a)** C Programming Language(MTMA SEC A, CO1): To make students understand the architecture of computers, constant, variables and data types of C Programming.
- b)** C Programming Language(MTMA SEC A, CO2): To discuss arrays, control statements, user defined functions.
- c)** C Programming Language(MTMA SEC A, CO3): To learn codes using nested loops and control statements, different types of tests of convergence and series of functions.

### Semester IV:

1. **a)** Reimann Integration & Series of Functions(MTMA CC8, CO1): To make students understand partition and refinement of closed and bounded interval.
- b)** Reimann Integration & Series of Functions(MTMA CC8, CO2): To discuss the Reimann integration, series of functions, Comparison and M-test, Power series & Fourier series.
- c)** Reimann Integration & Series of Functions(MTMA CC8, CO3): To solve problems by applying comparison theorem and M-tests.
2. **a)** Partial Differential Equation & Multivariate Calculus II(MTMA CC9, CO1): To make students understand first order partial differential equation, Lagrange's solution, classification of equations as hyperbolic, parabolic or elliptic.
- b)** Partial Differential Equation & Multivariate Calculus II(MTMA CC9, CO2): To discuss the Cauchy problem, Cauchy-Kowalewskaya theorem, multiple integral, Green's theorem, surface integral, Stroke's theorem and Divergence Theorem.
- c)** Partial Differential Equation & Multivariate Calculus II(MTMA CC9, CO3): To solve problems using Cauchy-Kowalewskaya theorem, Green's theorem, Stroke's theorem and Divergence Theorem.
3. **a)** Mechanics(MTMA CC10, CO1): To make students understand Coplanar forces, friction force, virtual work, laws of motion and gravitation.
- b)** Mechanics(MTMA CC10, CO2): To discuss the stability of equilibrium, kinematics of particle, laws of motion, particle dynamics etc.

  
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**c)** Mechanics(MTMA CC10, CO3): To solve problems using Newton laws of motion and law of gravitation.

**4. a)** Scientific computing with SageMath & R(MTMA SEC B, CO1): To make students understand SageMath and R, installation procedure and graphical representations of functions.

**b)** Scientific computing with SageMath & R(MTMA SEC B, CO2): To discuss SageMath & R commands for differentiation, higher order derivatives.

**c)** Scientific computing with SageMath & R(MTMA SEC B, CO3): To learn programming in SageMath & R, relation and logical operators, conditional statements.

### Semester V:

**1. a)** Probability & Statistics(MTMA CC11, CO1): To make students understand a sample space, probability of a function, discrete distributions.

**b)** Probability & Statistics(MTMA CC11, CO2): To discuss the Markov and Chebyshev's inequality, convergence in probability, central limit theorem etc.

**c)** Probability & Statistics(MTMA CC11, CO3): To solve problems using Markov and Chebyshev's inequality and analyze Chi-square, t and F-distributions.

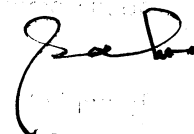
**2. a)** Group Theory II & Linear Algebra II(MTMA CC12, CO1): To make students understand automorphism, inner product space and Gram-Schmidt orthonormalisation process.

**b)** Group Theory II & Linear Algebra II(MTMA CC12, CO2): To discuss the definition of inner product space, method of Gram-Schmidt orthonormalisation process, Hessian matrix, Sylvester's laws of inertia etc.

**c)** Group Theory II & Linear Algebra II(MTMA CC12, CO3): To solve problems using Gram-Schmidt process, Sylvester's laws, Cayley Hamilton theorems etc.

**3. a)** Advanced Algebra(MTMA DSE A(1), CO1): To make students understand the group actions, Cayley's theorem, index theorem, Euclidean domain, polynomial rings.

**b)** Advanced Algebra(MTMA DSE A(1), CO2): To discuss Cayley's theorem, Cauchy's theorem, Sylow's theorem and Eisenstein criterion and unique factorization.




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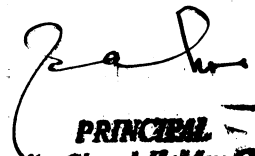
- c)** Advanced Algebra(MTMA DSE A(1), CO3): To solve problems using generalized Cayley's theorem, index theorem, Cauchy's theorem and Sylow's theorem.
- 4. a)** Linear Programming & Game Theory(MTMA DSE B(1), CO1): To make students understand L.P.P. and its formation, slack and surplus variables.
- b)** Linear Programming & Game Theory(MTMA DSE B(1), CO2): To discuss Duality theory, transportation and assignment problems, mathematical justification for optimality criterion, hungarian method and travelling salesman problem.
- c)** Linear Programming & Game Theory(MTMA DSE B(1), CO3): To solve the travelling salesman problem, transportation problem.

## Semester VI:

- 1. a)** Metric Space & Complex Analysis(MTMA CC13, CO1): To make students understand the definition and examples of metric spaces, limit point and closure of a set, continuous mapping, sequential criterion of continuity.
- b)** Metric Space & Complex Analysis(MTMA CC13, CO2): To discuss the stereographic projection, Mobius transformation, Cauchy-Hadamard theorem, Cauchy-Reimann equation, Cauchy Goursat theorem.
- c)** Metric Space & Complex Analysis(MTMA CC13, CO3): To solve problems using Mobius transformation, Cauchy-Hadamard theorem, Cauchy-Reimann equation, Cauchy Goursat theorem.
- 2. a)** Numerical Methods(MTMA CC14, CO1): To make students understand Lagrange and Newton's methods, different types of errors, Stirling's and Bessel's formulas.
- b)** Numerical Methods(MTMA CC14, CO2): To discuss the above theorems and along with interpolation formulas, Newton Cotes formula, Trapezoidal rule, Simpson's 1/3rd rule, Boole's rule, gaussian quadrature formula, Newton-Raphson method.
- c)** Numerical Methods(MTMA CC14, CO3): To solve problems using Gauss Jacobi method, Gauss Seidal, Boole's rule etc.
- 3. a)** Mathematical Modelling(MTMA DSE A(2), CO1): To make the students understand plotting of Bessel's function of first kind of order 0 to 3, automating the Frobenius Series Method.

  
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- b)** Mathematical Modelling(MTMA DSE A(2), CO2): To make students understand the Bessel's equation and Lagendre's equation, Frobenius series method, simplex method for 2/3 variables.
- c)** Mathematical Modelling(MTMA DSE A(2), CO3): To solve problems using Bessel's equation, Legendre's equation, Laplace transformation, Frobenius Series method etc.
- 4. a)** Advanced Mechanics(MTMA DSE B(2), CO1): To make students understand degrees of freedom, D' Alembert's principle, Lagranges first kind equation, generalized coordinates, Hamilton's principle etc.
- b)** Advanced Mechanics(MTMA DSE B(2), CO2): To discuss Canonical transformation, Hamilton's equations, Poisson Bracket, Hamilton-Jacobi's equation etc.
- c)** Advanced Mechanics(MTMA DSE B(2), CO3): To solve problems by Canonical transformation, Hamilton's equations, Poisson Bracket, Hamilton-Jacobi's equation etc.



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