DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. – 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

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Ref. No. ..... ***Date*** ***20***

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.

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.

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.
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-Schmidth 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 it's 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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