Department of Mathematics

(Gobinda Prasad Mahavidyalaya, Amarkanan, Bankura)

Course outcomes for (CBCS Generic and Program papers)

Semester-I

CC1: Calculus, Geometry & Differential Equation.

Course outcomes upon completion of this course, students should be able to:

- CO1: Understand the ideas of derivatives and higher order derivatives and double and triple integral.
- CO2: Expand functions using Leibnitz theorem and their application.
- CO3: Understanding the ideas of conics and their various applications.
- CO4: Apply the ideas of conics to explain many natural phenomena.
- CO5: Identify, analyse and subsequently solve physical situation whose behaviour can be described by ordinary differential equations.
- CO6: Evaluate and apply linear differential equations of second order (and higher).

Semester-II

CC2: Real Analysis

Course Outcomes Upon completion of this course, students should be able to:

- CO7: Explain continuity and discontinuity of various functions in different contexts.
- CO8: Describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- CO9: Describe the terms limit and limit points of a set.
- CO10: Explain the idea about sequence and monotone property.
- CO11: Apply various theorems on the existence of limits of sequences and their evaluation.
- CO12: Comprehend vigorous arguments developing the theory underpinning real analysis.

Semester-III

CC3: Algebra.

Course outcomes upon completion of this course, students should be able to:

- CO13: Explain the fundamental ideas of sets and functions.
- CO14: Determine equivalence relations on sets and corresponding equivalence classes.
- CO15: Formulate equations from available data and find solutions to real life problem.
- CO16: Explain different methods like Descartes method, Cardan's method, Ferrari's method in theory of equations.
- CO17: Understand various application of the theory of matrices to a wide variety of problems.
- CO 18: Acquire knowledge of invertible matrices and their properties.

SEC-1 Logic & Sets (Program Course)

Course Outcomes Upon completion of this course, students should be able to:

- CO19: Apply the logic theory of practical situations for drawing conclusions.
- CO20: Analyse statements using truth table
- CO21: Apply the logical structure of proofs and work symbolically with connections and quantifies to theory of sets, perform set operations.
- CO22: Determine equivalence relations on sets and corresponding equivalence classes.
- CO23: Explain the fundamental ideas of sets and functions.

 CO24: Produce logically valid, correct and clear arguments.

Semester-IV

CC4: Differential Equations & Vector Calculus.

Course Outcomes Upon completion of this course, students should be able to:

 CO25: Determine solutions to second order linear homogeneous differential equations with constant coefficients.

 CO26: Determine solutions to second order linear non-homogeneous differential equations with constant coefficients.

 CO27: Obtain power series solutions of differential equations.

 CO28: Develop the ability to apply differential equations to significant applied and/or theoretical problem.

 CO29: Apply vector algebra techniques to analyse problems involving two- and threedimensional entities-lines, curves, planes and surface.

 CO30: Employ the techniques of higher dimensional differential calculus in problems of physical interest.

SEC-2 Graph Theory: (Program Course)

Course Outcomes Upon completion of this course, students should be able to:

 CO31: Acquire a basic idea of graph, various terms associated and matrix representation of graphs.

 CO32: Familiarize with different type of graph, connectivity and properties.

 CO33: Illustrate the fundamental applications of graph theory in different walks of life.

 CO34: Understand trees and their properties.

 CO35: Identify vertices, edges and paths with specific such as bridges, Eulerian etc.

 CO36: Check for solutions of famous basic problems in graph theory, such as transportation problem, assignment problem, travelling salesman problem.

Semester-V (Program Course)

DSE-1A: Linear Programming

Course Outcomes Upon completion of this course, students should be able to:

 DSEO37: Analyse and solve linear programming models of real-life situation.

 DSEO38: Provide graphical solutions of linear programming problems with two variables, and illustrate the concept of convex and extreme points.

 DSEO39: Understand the theory of the simplex method.

 DSEO40: Know about the relationships between the primal and dual problems, and to understand sensitivity analysis.

 DSEO41: Learn about the applications to transportation, assignment problems.

 DSEO42: Learn about the two-person zero sum game problems.

SEC-3 Object Oriented Programming in C++

CO 43: Programming paradigms, characteristics of object oriented programming languages, structure of C++ program, differences between C and C++, basic C++ operators, Comments,

CO44: Working with variables, enumeration, arrays and pointer.

CO45: Objects, classes, constructor and destructors, friend function, inline function, encapsulation,
CO46: data abstraction, inheritance, polymorphism, dynamic binding,
CO47:operator overloading, method overloading, overloading arithmetic operator and comparison operators.

CO48:Template class in C++, copy constructor, subscript and function call operator,
CO49: Concept of namespace and exception handling.

Semester-VI (Program Course)

DSE-1B: Probability and Statistics
Course Outcomes Upon completion of this course, students should be able to:

- DSEO50: Define the principal concepts about probability.
- DSEO51: Calculate probabilities using conditional probability, rule of total probability and Bayes' theorem.
- DSEO52: Define the concept of random variable.
- DSEO53: Calculate the expected value, variance of a random variable.
- DSEO54: Learn about the Markov chain.
- DSEO55: Learn about the random samples, sampling distribution, estimation of parameters.

SEC-4 (Numerical Analysis with Practical)
Course Outcomes Upon completion of this course, students should be able to:

- CO 56: Identify methods to solve numerical algebraic and transcendental equations.
- CO57: Study the concepts of interpolation for unequal intervals.
- CO58: Gains knowledge about to interpolation for equal intervals.
- CO59: Understands the concepts of finite differences.
- CO60: Computes solutions to simultaneous linear algebraic equations.
- CO61: Identify methods to solve first order ordinary differential equation.

(Computer Practical)
Course Outcomes Upon completion of this course, students should be able to:

- CO62: Developing approximate numerical methods to solve algebraic and transcendental equations.
- CO63: Understand numerical methods to solve linear system of equations.
- CO64: Developing various numerical root finding methods.
- CO65: Develop the ability of effective usage of arrays, structures, functions and pointers.
- CO66: Understand and execution of programs written in c language.
- CO67: Develop the ability to solve algebraic and transcendental equations using C language.

Program Outcomes

By the end of a B.A. or B.Sc. program, a student will:

- PO1: Have an appropriate set of professional skills to ensure a productive career.
- PO2: Recognize and appreciate the connections between theory and applications.
- PO3: Communicate effectively with whom they are interacting and the society to make

effective presentations, and give and receive clear instructions.

- PO4: Be able to analyze, test, interpret and form independent judgments in both academic and non-academic contexts.
- PO5: Be prepared for life-long learning.
- PO6: Work effectively in a multi-disciplinary environment.
- PO7: Function effectively as an individual, and as a member or leader in diverse teams.

Program Specific Outcomes

By the end of B Sc program in Mathematics, a student will:

- PSO1: Construct abstract models using appropriate mathematical and statistical tools.
- PSO2: Identify suitable existing methods of analysis, if any, and assess his/her strengths and weaknesses in the context of the problem being considered.
- PSO3: Be prepared to use Mathematics, not only in the discipline of Mathematics, but also in other disciplines and in their future endeavors.
- PSO4: Develop the skills necessary to formulate and understand proofs and to provide justification.
- PSO5: Develop an understanding of the precise language of Mathematics, and be able to integrate mathematical arguments with their critical thinking skills.
- PSO6: Be a life-long learner who is able to independently expand his/her mathematical or statistical expertise when needed.
- PSO7: Be familiar with different areas of Mathematics.
- PSO8: Be able to solve problems using a broad range of significant mathematical techniques