Course Outcomes (COs) of B. Sc. Mathematics Programme

Course Outcomes (COs)

Semester I

MM1CRT01 - FOUNDATION OF MATHEMATICS

CO 1 – To describe fundamental ideas about sets and functions

CO 2 – To construct truth tables and get an idea about Boolean algebra and logic gates in circuits

CO 3 – Able to analyze statements using truth tables

CO 4 – Able to construct simple proofs

CO 5 – To identify mathematical symbols and explain standard methods of proofs

CO 6 – Able to solve polynomial equations.

Semester II

MM2CRT01 : ANALYTIC GEOMETRY, TRIGONOMETRY AND DIFFERENTIAL CALCULUS

CO 1 - Discuss the concept of higher order derivatives and their applications. Parametric Equations of curves and their applications are introduced to the student.

CO 2 - Compose higher order derivatives by applying Leibnitz Theorem.

CO 3 - Apply L‟Hospital‟s rule for computing limits of indeterminate forms.

CO 4 - Acquire ability to apply the theorem in a correct mathematical way.

CO 5 - Explain the concepts of Trigonometric functions, their properties and summation of trigonometric series.

CO 6 – Categorize the standard equations of parabola, hyperbola, and ellipse.

CO 7 – Explain the parametric forms of parabola, hyperbola, and ellipse

Semester III

MM3CRT01 : CALCULUS

CO 1 - Find curvature and related parameters of a given curve.

CO 2 - Find partial derivatives of functions of more than one variable.

CO 3 - Examine how the ideas of maxima and minima can be used to solve practical problems

CO 4 - Compose the area and volume of solids using definite integrals.

CO 5 - Examine the arc length of a given curve and area enclosed by curves.

CO 6 - Use of cylindrical and spherical co-ordinates in evaluating triple integrals.

CO 7 – Apply triple integrals to finding volumes of solid objects.

Semester IV

MM4CRT01 : VECTOR CALCULUS, THEORY OF NUMBERSAND LAPLACE TRANSFORM

CO 1 - Apply vector calculus to real world problems.

CO 2 - Develop proficiency in the analysis of vector valued functions

CO 2 - Discuss the various properties of the gradient, the curl and divergence.

CO 3 – Solve vector problems by applying Green‟s theorem, Divergence theorem and Stoke‟s theorem.

CO 4 -Discuss the Laplace transform of a given function.

CO 5 - Discuss the basic definitions and theorems in number theory.

CO 6 -Ability to apply number theory algorithms and procedures to basic problems.

Semester V

MM5CRT01 : MATHEMATICAL ANALYSIS

CO1- To discuss the concept of Algebraic and Completeness properties of real numbers.

CO2- To describe sequences and their limits and also about its convergence and divergence.

CO3- Explain Bolzano-Weierstrass Theorem , The Cauchy Criterion.

CO4- To discuss the basic ideas of series and absolute convergence.

CO5- To explain various tests for absolute and non-absolute convergence of series.

CO6- To discuss the Limit Concepts.

MM5CRT02 : DIFFERENTIAL EQUATIONS

CO 1 – To identify various types of differential equations of first order and obtain its solution

CO 2 – To find the complementary function and particular integrals of linear differential equation

CO 3 – To illustrate the orthogonal trajectory of the system of curves on a given surface

CO 4 – Describe the origin of partial differential equation and distinguish the integrals of first order linear partial differential equation into complete, general and singular integrals.

CO 5 – To use the method of solution of Lagrange for solving the first order partial differential equation

CO 6 – To categorize the fundamental ideas about the power series solution of equations in Physics such as Legendre‟s equation, Bessel‟s equation, Airy‟s equation, etc.

MM5CRT03: ABSTRACT ALGEBRA

CO1 – Explain important mathematical concepts in abstract algebra such as definition of a group, order of a finite group and order of an element.

CO2 – Identify and explain different types of subgroups such as normal subgroups, cyclic subgroups their structure and characteristics .

CO3 – Explain many mathematical concepts studied in abstract mathematics such as permutation groups, factor groups and Abelian groups.

CO4 - Describe about major mathematicians or important contribution in the development of group theory

CO5 - Apply the results from group theory to study the properties of rings and fields and also to some advanced level of abstract algebra and its applications

MM5CRTO4: HUMAN RIGHTS AND ENVIORNMENTAL MATHEMATICS

CO1 - To investigate how and why things happen, and make their own decisions about complex environmental issues.

CO2 - To identify various problems with respect to the environment.

CO3 - To find the inter-relationship between man and environment for protecting the nature and natural resources and acquiring basic knowledge about environment.

CO4 - To create an idea of Indian Constitution, its Articles and about Human Rights.

CO5 - To Identify Fibonacci Numbers and Golden Ratio in nature.

CO6 - To examine g.c.d of numbers using Euclidean Algorithm and solving Linear Homogeneous Recurrence Relations With Constant Coefficients. (LHRRWCC).

MM5GET02 : APPLICABLE MATHEMATICS (Open Course)

CO 1- To examine the basic ideas of Mathematics such as quadratic equations, trigonometry, etc.

CO2- Able to write competitive examinations with confidence

CO3 - To discuss mathematical concepts and problem solving skill.

CO 4- Apply short cut methods for solving problems.

Semester VI

MM6CRT01 : REAL ANALYSIS

CO1- To compare Continuity and Uniform Continuity.

CO2- To discuss the concept of Derivatives, L"Hospitals Rule.

CO3 - Able to analyse Taylor"s Theorem and Mean value Theorem.

CO4 - To categorize the concepts of Reimann integration and related theorems.

CO5 - To Identify the properties of pointwise convergence and absolute convergence of sequences.

CO6 -To categorize the ideas of series of function.

MM6CRT02: GRAPH THEORY AND METRIC SPACES

CO1- Construct some important classes of graph theoretic problems

CO2- Explain the concept of trees in practical life applications such as current flow, linguistic grammar and apply some basic algorithms for graphs

CO3 - Identify graph applications in day to day problems through graph Modeling and also the fundamental concepts in graph theory for further research needs.

CO4- Compare and examine various metric spaces evolved from its basic practical definition of usual distance in Euclidean plane

CO5- Will be able to investigate into topological properties of metric spaces which consequently sow a strong platform for further research

MM6CRTO3 : LINEAR ALGEBRA

CO 1 – Identify vectors in n-space which is useful in representing data.

CO 2 - Discuss linear system of equations using matrix as a tool.

CO 3 - Examine the geometric ideas and the relationship of vector space theory and matrix theory.

CO 4 - Explain eigen values and eigen vectors which are significant in dynamic problems.

CO 5 - Relate the concepts of linear transformation and matrix representation.

CO 6 –Able to find the null space, range space of linear transformations.

MM6CRT04 : COMPLEX ANALYSIS

CO1 -To describe the basic concepts in complex analysis like modulus, amplitude, polar forms etc.

CO2 -To examine important concept like analytic functions, entire functions, harmonic functions and elementary functions.

CO3 -To compare and contrast between real functions and complex functions

CO4 -To discuss about complex integration

CO5 -To discuss with series representation of analytic function

CO6 -Analyze the various applications of complex integration

CO7 -To discuss about singular, poles and evaluation of complex integrals.

MM6CBT01 : OPERATIONS RESEARCH

CO1 - To solve LPP using Graphical method, Simplex Method and Big-M Method.

CO2 - To form dual of an LPP and theorems of duality with proof.

CO3 - To solve transportation and assignment problem.

CO4 – To find different solution methods of Games without saddle points.

PHYSICS COMPLEMENTARY COURSES FOR

BSC MATHEMATICS

Semester-I
PH1CMT01: PROPERTIES OF MATTER AND ERROR ANALYSIS

On successful completion of the course, the students will be able to

CO1 **Define** states of matter.

CO2 **Construct** an idea of properties of solids and **illustrate the** use of material with their properties.

CO3 **Develop** the following concepts and **solve** problems involving them
a. Hooke's Law and other stress-strain laws
b. Determination of rigidity modulus
c. Uniform and Non- uniform bending
d. I Section girder

CO4 **Construct** an idea of properties of liquids and **explain** different phenomena associated with it.

CO5 **Study** the motion of fluids by **developing understanding** of viscosity, Poiseuille‟s Law and Bernoulli's Equation.

CO6 **Examine and describe** Experimental methods and error analysis.

Semester-II
PH2CMT01: MECHANICS AND ASTROPHYSICS

On successful completion of the course, the students will be able to

CO1 **Discuss** the physical quantities of accelerated motion of objects.

CO2 E***xplain*** *different terms associated with rotational mechanics and* ***obtain solutions*** *to physical problems of rotational mechanics.*

CO3 **Assess** the moment of inertia of different structures using parallel and perpendicular axes theorem.

CO4 **Explain** oscillatory motion and **design** and **classify** different oscillators.

CO5 **Describe** the concept of wave motion and able to **construct** different models describing wave motion.

CO6 **Discuss** various theories of evolution of stars and **explain** various physical parameters that affecting the star.

Semester-III
PH3CMT01: MODERN PHYSICS AND ELECTRONICS

On successful completion of the course, the students will be able to

CO1 ***Explain*** *different atom models and its basic features.*

CO2 **Describe** atomic nucleus and **classify** the nucleus according to their properties and salient features. **Explain** radioactivity and **discuss** different aspects of nuclear energy in nuclear reactors and radio carbon dating.

CO3 **Familiar** with the main aspects of the historical development of quantum mechanics and be able to **discuss** and **interpret** experiments that reveal the wave properties of matter

CO4 **Understand** the central concepts and principles in quantum mechanics, such as the Schrödinger equation, the wave function and its statistical interpretation, the uncertainty principle, stationary and non-stationary states, time evolution of solutions.

CO5 **Describe** the properties of materials and **application** of semiconductor electronics. **Apply** the knowledge of semiconductors to **illustrate** the functioning of basic electronic devices.

C06 ***Use*** the operations with basic number systems and **identify** its applications in digital electronics.

Semester-IV
PH4CMT01: OPTICS AND ELECTRICITY

On successful completion of the course, the students will be able to

CO1 **Discuss** the interference phenomenon and **explain** the significance of it by **illustrating** examples. **Resolving** numerical examples of interference in different context.

CO2 **List out** different types of diffraction and **categorise** various physical problems of diffraction.

CO3 **Explain** the concept of polarization and **describe** various theorems of it. **Design** and **illustrate** Polaroids and **find** the applications of it.

CO4 **Explain** the working of laser and **compare** different types of lasers. **Predict** the applications of lasers. **Illustrate** the working of Optical Fiber by **designing** a working model of it.

CO5 **Discuss** dielectric material and its properties.

CO6 **Describe** transient current, its growth and decay and **analyse** working of various AC circuits in it.

STATISTICS COMPLEMENTARY COURSES FOR BSC MATHEMATICS

Semester 1

ST1CMT01 - Descriptive Statistics

Upon successful completion of the course, a student will be able to

CO1 - Identify appropriate sampling and data collection processes

CO2 - Present data objectively using tables, diagrams and graphs

CO3 – Calculate measures of central tendency and measures of dispersion in grouped and ungrouped data cases

CO4 – Examine the significance of moments and kurtosis

CO5 – Explain index numbers as a method to identify trends in data set

Semester 2

ST2CMT02 - Probability Theory

Upon successful completion of the course, a student will be able to

CO1 – Compute the probability of events and use the basic probability rules, including additive and multiplicative laws

CO2 - Explain the concept of probability distribution and probability density functions

CO3 - Calculate probabilities, and derive the marginal and conditional distributions of bivariate random variables

CO4 – Use correlation coefficient to describe the direction and strength of a liner relationship

CO5 – Explain regression technique as a method to model pattern in the data and to make predictions

Semester 3

ST3CMT03 – Probability Distributions

Upon successful completion of the course, a student will be able to

CO1 – Explain the concept of moments, MGF and characteristic function of random variables

CO2 – Identify the type of statistical situation to which different standard distributions can be applied

CO3 - Use standard normal curve to calculate the area under normal curve

CO4 - Apply Tchebycheff `s inequality, Bernoulli`s law of large numbers, Weak law of large numbers and Central Limit Theorem to calculate probabilities

CO5 - Compare the different sampling distributions

Semester 4

ST4CMT04 - Statistical Inference

Upon successful completion of the course, a student will be able to

CO1 – Use different estimation methods to find point and interval estimators

CO2 – Discuss the properties of good estimators

CO3 - Define null hypothesis, alternative hypothesis, type 1 and type 2 error, level of significance and test statistic

CO4 –Conduct statistical hypotheses testing to test for means, proportions and variance in one and two sample cases

CO5 – Examine the association between the attributes and test goodness of fit using Chi-square test