

Post Graduation Department of Mathematics

M.Sc. (MATHEMATICS) –I (SEMESTER I & II) SESSION: 2022-23

Programme Outcomes:

- Inculcate critical thinking to carry out scientific investigation objectively without being biased with preconceived notions.
- Equip the student with skills to analyze problems, formulate a hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.
- Prepare students for pursuing research or careers in industry in mathematical sciences and allied fields
- Imbibe effective scientific and/or technical communication in both oral and writing.
- Continue to acquire relevant knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematical sciences.
- Create awareness to become an enlightened citizen with commitment to deliver one's responsibilities within the scope of bestowed rights and privileges.

Programme Specific Outcomes:

- Inculcate strong understanding of the fundamental axioms in mathematics and capability of developing ideas based on them.
- Students will be able to understand disciplines such as Analysis, Algebra, Geometry, Topology, Measure Theory, Rings & Modules and Special functions explained with strong background.
- Helps in good understanding of number theory which can be used in modern online cryptographic technologies.
- Inculcate mathematical reasoning.

CO 1: MATHEMATICAL ANALYSIS

On completion of this course, the students will be able to:

-) Understand the concept of metric space, open sets, closed sets and compactness.
-) Understand the theory of Riemann-Stieltjes integral and its properties.
-) Study rearrangement of series, Riemann's Rearrangement theorem and power series.
-) Analyse the function of several variables, derivatives and their applications.

CO 2: ALGEBRA

On completion of this course, the students will be able to:

-) Remember the properties of solvable and nilpotent groups.
-) Understand the concept of class-equations, properties of permutation group and its application.
-) Apply the structural theory of some finite abelian groups and sylow's theorems to solve different problems.
-) Understand commutative rings, ideals and their properties

CO 3: COMPLEX ANALYSIS

On completion of this course, the students will be able to:

-) Understand functions of a complex variable, analytic functions and their properties.
-) Study cauchy's theorem & integral formulas and their examples.

-) Evaluate singularities of functions and residues
-) Understand the concept of analytic continuation and natural boundary of an analytic function.

CO 4: ORDINARY DIFFERENTIAL EQUATIONS

On completion of this course, the students will be able to:

-) Understand the existence, uniqueness and continuity of solutions of first order ODE's.
-) Evaluate the solutions of initial and boundary value problems.
-) Understand the eigen values and eigen functions of Sturm–Liouville systems
-) Analyze the qualitative behavior of solutions of system of differential equations.

CO 5: NUMBER THEORY-I

On completion of this course, the students will be able to:

-) Understand the concepts of prime numbers, divisibility, congruence, g.c.d., prime factorizations.
-) Apply the results of Chinese remainder theorem, Fermat's Little theorem and Wilson's theorem.
-) Analyse residue classes and its applications.
-) Understand the concept of different arithmetic functions and their relations

CO 6: DIFFERENTIAL GEOMETRY

On completion of this course, the students will be able to:

-) Evaluate the curvature and torsion of space curves and understand the fundamental theorem for space curves
-) Understand the concept of involutes and evolutes with the help of examples.
-) Remember about Gaussian map and Gaussian curvature of a curve.
-) Analyse the concept related to conjugate directions, asymptotic lines and fundamental forms.

CO 7: FUNCTIONAL ANALYSIS

On completion of this course, the students will be able to:

-) Understand the concept of norm and its completeness.
-) Study the concept of Hahn-Banach Theorem, Open mapping theorem, Closed graphs.
-) Analyse the difference between Banach Spaces and Hilbert Spaces. Also check the totality of orthonormal sets.
-) Understand the basic concepts of operators and its classification.

CO 8: RINGS& MODULES

On completion of this course, the students will be able to:

-) Understand the concept of UFD, PID, Euclidean domain and polynomial rings.
-) Remember the examples of Modules and apply homomorphism theorems on it. Also analyse the difference between vector spaces and modules.
-) Remember results related to Artinian modules and Noetherian modules.
-) understand the basic concepts of radicals and their properties

CO 9: TOPOLOGY

On completion of this course, the students will be able to:

-) Understand the topological spaces and having a grasp on basic results on set theory.
-) Evaluate interior, closure, boundary points, limit points of subsets and to create basis, sub basis of topological spaces.
-) Understand the continuity of functions in general way, concepts of homeomorphism and to distinguish the spaces up to homeomorphisms.
-) Analyse the connectedness and path connectedness of spaces.

CO 10: MEASURE THEORY

On completion of this course, the students will be able to:

-) Understand the basic definition, concepts of outer measure of sets.
-) Analyse the Lebesgue integral and their properties.
-) Understand the concepts of functions of bounded variation and the absolute continuity of functions.
-) Learn and apply the Holder and Minkowski inequalities in L^p spaces and understand the completeness of L^p spaces.

CO 11: NUMBER THEORY-II

On completion of this course, the students will be able to:

-) Understand the Fibonacci sequence, Golden Ratio and Farey Sequences
-) Evaluate the best rational approximation with the help of continued fraction.
-) Study the concepts of Binary Quadratic Forms
-) Analyse intriguing findings related to properties of prime numbers

CO 12: Special Functions

On completion of this course, the students will be able to:

-) Understand the basic concepts of Beta and Gamma functions
-) Evaluate the recurrence relation and orthogonality of Legendre, Laguerre and Bessel's functions.
-) Evaluate generating functions of Legendre, Laguerre and Bessel's functions.
-) Understand Hermite polynomial and its basic properties.

CO 13: Vedic Mathematics

On completion of this course, the students will be able to:

-) Understand the basic concepts of Vedic Sutras.
-) Analyse mathematical skills by learning new methods of basic mathematical operations for fast calculations.
-) Evaluate the squares and cubes of big numbers efficiently.
-) Understand the concept of calculating square roots and cube roots in quick way.

M.Sc. (Mathematics) - II
2022-23
(Semester III & IV)

Programme Outcomes:

- Inculcate critical thinking to carry out scientific investigation objectively without being biased with preconceived notions.
- Equip the student with skills to analyze problems, formulate a hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.
- Prepare students for pursuing research or careers in industry in mathematical sciences and allied fields
- Imbibe effective scientific and/or technical communication in both oral and writing.
- Continue to acquire relevant knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematical sciences.
- Create awareness to become an enlightened citizen with commitment to deliver one's responsibilities within the scope of bestowed rights and privileges.

Programme Specific Outcomes:

- ⌋ Prepare and motivate students for research studies in mathematics and related fields.
- Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains.
- Provide advanced knowledge on topics in pure mathematics, empowering the students to pursue higher degrees at reputed academic institutions.
- Nurture problem solving skills, thinking, creativity through assignments, project work.
- Sound knowledge of mathematical modeling, programming and computational techniques.
- Assist students in preparing (personal guidance, books) for competitive exams e.g. NET, GATE, etc.

CO 1: FIELD THEORY

On completion of this course, the students will be able to:

- ⌋ Identify and construct the examples of finite as well as infinite fields.
- ⌋ Learn about constructing the algebraic, normal, separable, Galois, cyclic extensions of fields.
- ⌋ Learn about the structures and extensions of given fields.
- ⌋ Classify finite fields using roots of unity.

CO 2: MATHEMATICAL METHODS

On completion of this course, the students will be able to:

- ⌋ Perform integration and other operations by approximation techniques.
- ⌋ Solve wide range of problems in physical sciences using calculus of variations.
- ⌋ Translate a practical problem into mathematical problem and solve it by means of calculus.
- ⌋ Familiarize various essential procedure and tools to solve Linear Integral Equations.

CO 3: OPTIMIZATION TECHNIQUES-I

On completion of this course, the students will be able to:

- ⌋ Learn about the convex sets, their properties and the formulation of real-life problems into mathematical problem.
- ⌋ Understand importance of optimization of industrial process management and apply basic concepts of mathematics to formulate an optimization problem.
- ⌋ Study Linear Programming with applications to transportation, assignment problems and game theory

CO 4: MATHEMATICAL STATISTICS-I

On completion of this course, the students will be able to:

-)] Frame problems using numerous mathematical and statistical depictions of appropriate structures and relationships and to **solve** using standard techniques.
-)] Communicate clearly quantitative ideas both orally and in writing.
-)] Define, illustrate and apply certain frequently used discrete and continuous probability distributions.

CO 5: CATEGORY THEORY – I

On completion of this course, the students will be able to:

-)] Understand the basics concepts and methods of category theory.
-)] Enable the students work with commutative diagrams, and universality properties.
-)] Apply categorical ideas and methods in wide range of area of mathematics.

CO 6: FUZZY SETS AND APPLICATIONS

On completion of this course, the students will be able to:

-)] Understand the difference between crisp set theory and fuzzy set theory
-)] Recognize basic knowledge of fuzzy sets and fuzzy logic membership functions.
-)] Handle the problems having uncertain and imprecise data.
-)] Find the optimal solution of mathematical programming problems having uncertain and imprecise data.

CO 7: ADVANCED TOPOLOGY

On completion of this course, the students will be able to:

-)] Learn the concepts of net and filters in a topological space.
-)] Study separation axioms more specifically.
-)] Familiar with the Urysohn's Lemma and Tietze's extension theorem to characterize metrizable spaces.
-)] Study the concepts of compactness and to learn about Bolzano- Weierstrass property of a space and Tychonoff theorem.
-)] Prove a selection of theorems concerning product topologies and quotient topologies.

CO 8: NUMERICAL ANALYSIS

On completion of this course, the students will be able to:

-)] Recognize the errors, source of error and its effect on any numerical computations
-)] Learn how to obtain numerical solution of nonlinear equations using bisection, secant, newton, and fixed-point Iteration methods.
-)] Learn how to solve system of linear equations numerically using direct and iterative methods.
-)] Understand how to approximate the functions using interpolating polynomials.
-)] Learn how to solve definite integrals and initial value problems numerically.

CO 9: FLUID MECHANICS

On completion of this course, the students will be able to:

-)] Understand the concept of fluid and their classification, models and approaches to study the fluid flow.
-)] Familiar with three dimensional motions, Kelvin's Theorem.
-)] Learn the concept of stress and strain in viscous flow

CO 10: COMPLEX ANALYSIS-II

On completion of this course, the students will be able to:

-)] Demonstrate understanding of deeper aspects of complex analysis such as Riemann Mapping Theorem.
-)] Know about harmonic function theory on a disk.
-)] Enrich the students with concepts of convex and star like functions, close to convex functions.

CO 11: PARTIAL DIFFERENTIAL EQUATIONS

On completion of this course, the students will be able to:

-)] Study the solutions of one-dimensional Wave and Heat equations employing the methods in Partial Differential equations.
-)] Study Laplace's equation in two dimension and to prove a selection of theorems.

CO 12: TENSOR CALCULUS

On completion of this course, the students will be able to:

-)] Introduce the concepts of dummy and free index and summation convention.
-)] Learn the transformation of co-ordinates in Tensor notation
-)] Enable the students to perform the matrix calculations in Tensor notation
-)] Learn the curvilinear co-ordinates in Tensor notation.
-)] Learn about properties and transformations of the Christoffel Symbol

CO 13: MATHEMATICAL STATISTICS-II

On completion of this course, the students will be able to:

-)] Study the concepts of statistics those are more helpful in conducting research.
-)] Recognize and compute the sampling distributions of means and variances and the t- and F-distributions.
-)] Understand, apply and compute in one and two sample test of Hypothesis problems.
-)] Recognize the concept of ANNOVA techniques.

CO 14: CATEGORY THEORY -II

On completion of this course, the students will be able to:

-)] Understand the basics concepts and methods of category theory.
-)] Study the Yoneda lemma and its applications.
-)] Apply categorical ideas and methods in wide range of area of mathematics

CO 15: OPTIMIZATION TECHNIQUES-II

On completion of this course, the students will be able to:

-)] Introduce more advanced methods of Programming
-)] Introduce Decision Theory and Simulation.

CO 16: COMMUTATIVE ALGEBRA

On completion of this course, the students will be able to:

-)] Know the localization of rings at prime ideal.
-)] Know more closely the polynomial rings in one or more variables over a commutative ring and their prime spectrum.
-)] Study constructions like tensor product and basic theory of it. Understand the basic theory for support and associated prime ideals of modules and know primary decomposition of ideals.

CO 17: OPERATIONS RESEARCH

On completion of this course, the students will be able to:

-)] Identify and develop operation research models from the real system and to understand the mathematical tools that are needed to solve optimization problems.
-)] Demonstrate the network models and to learn the various algorithms for their solution.
-)] Gain knowledge about the queuing and replacement problems.

CO 18: NON-LINEAR PROGRAMMING

On completion of this course, the students will be able to:

-)] Classify the non-linear programming problems.

-)] Study unconstrained optimization methods, constrained optimization methods, convex analysis, Lagrangian relaxation, non-differentiable optimization, and applications in integer programming.
-)] Enhance the applications drawn from control, communications, power systems, and resource allocation problems.

CO 19: ANALYTIC NUMBER THEORY

On completion of this course, the students will be able to:

-)] Study the various arithmetic functions, their properties and to identify the multiplicative and completely multiplicative arithmetic functions.
-)] Enable the students to prove elementary result on sum over primes and use these to calculate averages of additive arithmetic functions.
-)] Study the Dirichlet's characters and their applications.

CO 20: THEORY OF LINEAR OPERATORS

On completion of this course, the students will be able to:

-)] Formally introduce the notion of operators and linearity.
-)] Discuss basic operator terminology and the linear operators.
-)] Study the basic know how of Null Spaces and Range Spaces.
-)] Study Spectral Properties of Compact Linear Operators.

CO 21: THEORY OF LINEAR OPERATORS

On completion of this course, the students will be able to:

-)] Formally introduce the notion of operators and linearity.
-)] Discuss basic operator terminology and the linear operators.
-)] Study the basic know how of Null Spaces and Range Spaces.
-)] Study Spectral Properties of Compact Linear Operators.

CO 22: ALGEBRAIC CODING THEORY

On completion of this course, the students will be able to:

-)] Get an insight into matrix representation of a code as well as encoding and decoding.
-)] Understand Hamming codes, BCH codes.
-)] Learn about cyclic codes and their generator polynomial.
-)] Understand the construction of binary codes in different ways and error detection and correction by various methods.

CO 23: ALGEBRAIC TOPOLOGY

On completion of this course, the students will be able to:

-)] Grasp the basics of Algebraic Topology.
-)] Determine fundamental groups of some standard spaces like Euclidean spaces and spheres.
-)] Understand the theorems like Fundamental theorem of Algebra, Brower's fixed-point theorem, Borsuk-Ulam theorem

CO 24: SOLID MECHANICS

On completion of this course, the students will be able to:

-)] Learn how to obtain stresses and deflection of beams on elastic foundation.
-)] Apply various failure criteria for general stress states at points.
-)] Analyze solid mechanics problems using classical methods and energy methods
-)] Analyze the behavior of structural and machine components subject to various loading and support condition based on principle of equilibrium

B.Sc. HONS MATHEMATICS (2022-23)

PROGRAMME OUTCOMES

PO1. Create deep interest in learning Mathematics.

PO2. Develop broad and balanced knowledge of elective subjects like Computer Science, Statistics, Accounts and Music.

PO3. Familiarize the students with suitable tools of Mathematical analysis to handle issues and problems in Mathematics and related sciences.

PO4. Enhance the ability of learners to apply the knowledge and skills acquired by them during the programme to solve specific theoretical and applied problems in Mathematics and Computer science.

PO5. Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Mathematics & Computer science and its allied areas on multiple disciplines concerned with Mathematics and computing.

PO6. Encourage the students to develop a range of generic skills helpful in employment, internships and social activities.

PROGRAMME SPECIFIC OUTCOMES

PSO1. Students completing this programme will be able to present Mathematics and computing clearly and precisely, make vague ideas precise by formulating them in the language of Mathematics & computers and describe mathematical ideas from multiple perspectives.

PSO2. Students acquire a systematic understanding of the fundamental concepts and theories of Mathematics and can explain to non-mathematicians.

PSO3. This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various public and private enterprises, and help students to qualify JAM, NBHM, CAT, UPSC etc.

PSO4. Strengthen the mathematical ability & computing knowledge, abstract intelligence and orient themselves towards higher mathematics, computing and research.

COURSE OBJECTIVES

BHMTH 102(A): DIFFERENTIAL CALCULUS

- To apply function of two or multivariable in real life.
- To understand the concept of functions of one and two variables.
- To understand the concept of the nth order derivative using Leibnitz theorem.
- To familiarize with concavity, convexity and Asymptotes.
- To understand the concept of two or more variables for differential calculus.

BHMT 102(B): MATHEMATICS LAB-I

Course Objectives: The Primary objective of this course is to enable students to solve problem based on Differential Calculus.

BHMT 103: ALGEBRA AND TRIGONOMETRY

)To recognize consistent and inconsistent systems of linear equations by the row echelon form of matrices.

)To find eigenvalues and corresponding eigenvectors for a square matrix.

)To understand the importance of roots of real and complex polynomials.

)To learn various methods of solving equations.

) To apply De Moivre's Theorem to solve numerical problems.

BHMT 105(A): MATHEMATICAL FOUNDATION OF STATISTICS

The Primary objective of this course is to introduce the students with Statistics.

)To learn with definitions, aims, scope and significance of statistics.

)To learn various measures of central tendency and dispersion.

)To understand the concept of Correlation and Regression.

)To understand the concept of Index Number and Time Series

Statistics Lab

Course objectives: The Primary objective of this course is to enable students to solve problem based on Central tendency, Dispersion, time series, Index Number, Correlation and regression.

BHMT 201: SEQUENCE AND SERIES

The Primary objective of this course is to introduce students with the concept of sequence of real numbers and its convergence.

)To introduce Cauchy and monotonic sequences and to check existence of their limit superior, limit inferior.

)To test convergence and divergence of infinite series.

)To introduce knowledge of different kinds of convergence criterion for series.

BHMT 202(A) ANALYTICAL GEOMETRY

)To enable the students understand the applications of plane and solid geometry.

)To understand the properties of ellipse, parabola and hyperbola.

)To be well-versed with sphere, cone and cylinder

BHMT 202(B): Mathematics Lab II

Course Objectives: The Primary objective of this course is to enable students to solve problem based on plane and solid geometry using MATHEMATICAL Computational Tools.

BHMT 204(A) : LINEAR PROGRAMMING

The Primary objective of this course is

)To analyze and solve linear programming models in real life situations.

)To provide graphical solutions to linear programming problems in two variables

)To understand the relationship between Primal and Dual problems.

)To acquaint the students with the Transportation, Assignment and Game problems along with the applications.

BHMTH 301: INTEGRAL CALCULUS

Course Objective: This course aims to impart knowledge of different types of integrals and will make them understand the relationship between summation and integration using Riemann Integration.

On completion of this course, the student will be able to

CO-1. Understand how to analyze and find integral of hyperbolic function, rational function, trigonometric function and logarithmic function.

CO-2. Understand the concept of Improper Integral and multiple integral.

CO-3. Understand the concept of partition and fundamental concept of Riemann Integration.

CO-4. To apply knowledge and skills relating to integration to solve problems of calculating the area and volume.

BHMTH 302: DIFFERENTIAL EQUATIONS-I

The objective of the course is to help students to acquire the basic skills to calculate different types of differential Equations and to introduce concept of series solutions to the differential equations.

CO-1. Know about solutions of first and higher order differential equations.

CO-2. Exhibit the techniques for obtaining solutions to ordinary differential equations.

CO-3. To investigate the qualitative and quantitative behavior of solutions of system of differential equations.

CO-4. To develop interests in solving a number of problems related to model natural phenomena, engineering systems and many other situations.

BHMTH 303: NUMBER THEORY-I

The aim of this course is to impart the knowledge of distinguished properties of divisibility and congruences and their use in making lengthy calculations with easy and short cut methods.

CO-1. Understand the concepts of prime numbers, divisibility, congruence, prime factorizations and their applications to solve lengthy calculations.

CO-2. Find quotients and remainders without long integer division.

CO-3. Students learnt about Fibonacci sequence and also enabled to improve the ability of mathematical thinking.

CO-4. Students learnt the concept of cryptography used in coding theory practically used in life.

BHMTH-304: PROGRAMMING USING C

To learn the basics of logic development and coding using a Programming language C by writing well-structured programs.

After completion of this course students will able to

CO1: Develop efficient algorithms for solving a problem

CO2: Understand the basic terminology used in computer programming.

CO3: Foundation for the higher level of programming languages.

CO4: Develop confidence and ability for learning needed for Computer language.

BHMTH-304A: SOFTWARE LAB-III (BASED ON BHMTH-304)

To learn the basics of logic development and coding using a Programming language C by writing well structured programs. After completion of this course students will be able to

CO1: Develop efficient algorithms for solving a problem

CO2: Understand the basic terminology used in computer programming.

CO3: Foundation for the higher level of programming languages.

CO4: Develop confidence and ability for learning needed for Computer language.

BHMTH 305: PROBABILITY THEORY

Course Objective: This course aims to enable the students to apply probabilistic and statistical reasoning to describe and analyze essential features of data sets and problems in real-life business situations.

CO-1. To understand the concept of random variables, probability mass function, probability density function.

CO-2. Understand the difference between discrete and continuous distributions.

CO-3. Understand the concept of sampling distributions.

CO-4. To study Central Limit Theorem and its applications.

BHMTH 401: REAL ANALYSIS

The aim of this course is to describe the fundamental properties of the real numbers that underpin the formal development of understanding of the theory of sequences and series, continuity, differentiation and integration.

On completion of this course, the student will be able to

CO-1. Understand the concept of Bounded Variation and its properties.

CO-2. Solve Riemann-Stieltjes integral using Riemann integral.

CO-3. Understand the concept of sequences and series of functions their convergence and uniform convergence.

BHMTH 402: VECTOR CALCULUS AND VECTOR MECHANICS

The aim of this course is to make the students acquire facility and confidence in the use of vectors and vector calculus so that they may employ the same in an effective manner to various applications.

On completion of this course, the student will be able to

CO-1. Find different types of products, differentiate and solve applied problems involving vector-valued functions.

CO-2. Learn integration of the vector valued functions and its applications.

CO-3. understand the theoretical Principles of Mechanics and to clarify the physical foundations of dynamics.

CO-4. Formulate suitable mathematical real life problems and their solutions.

BHMTH 403: NUMBER THEORY- II

The main objective of the course is to familiarize the students with advanced topics of number theory like continued fractions and their applications, partitions and averages of arithmetic functions.

On completion of this course, the student will be able to

CO-1. Familiarize the students with some history of Mathematics.

CO-2. Understand the concepts of Continued fractions and their applications.

CO-3. Understand the concept of partitions, binary quadratic forms and representation of numbers as sum of squares.

CO-4. Find the Primitive roots and solutions of Diophantine Equations.

BHMTH-405: NUMERICAL METHODS

This course enables the students to design and analyze techniques to give approximate but accurate solutions to difficult problems.

On completion of this course, the students learnt

CO-1. Appropriate numerical methods to solve algebraic and transcendental equations.

CO-2. The rules of numerical integration.

CO-3. How to study Interpolation Methods and its applications.

CO-4. To solve first order initial value problems of ODE's.

BHMTH 501: ABSTRACT ALGEBRA

The Primary objective of this course are

- To be able to understand the Group Structure and different properties of Groups.
- To know the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains and fields.
- To learn in detail about polynomial rings, fundamental properties of finite field extensions and classification of finite fields.

BHMTH 502: MATHEMATICAL METHODS

The Primary objective of this course is

)To know about piecewise continuous functions, Dirac delta function, Laplace transforms and its properties.

)To solve ordinary differential equations using Laplace transforms.

)To familiarize with Fourier transforms of functions belonging to L class, relation between Laplace and Fourier transforms.

)To learn the concept of Fourier series.

)To apply the concepts of the course in real life problems.

BHMTH 503: STATICS

Course Objectives: The Primary objective of this course is

)To introduce the students with concept of matter at rest.

)To understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body.

)To determine the centre of gravity of some materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight.

BHMTM 504(I): DISCRETE MATHS

The Primary objective of this course is:

-)]To learn about partially ordered sets, lattices and their types.
-)]To understand Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.
-)]To enable students to solve real-life problems using finite-state and Turing machines.
-)]To assimilate various graph theoretic concepts and familiarize with their applications.

BHMTM 504(II): TENSOR ANALYSIS

-)]To introduce the concepts of dummy and free index and summation convention.
-)]To learn the transformation of co-ordinates in Tensor notation
-)]To enable the students to perform the matrix calculations in Tensor notation
- To learn the curvilinear co-ordinates in Tensor notation

BHMTM 505 (A) LEBESGUE THEORY OF INTEGRATION

-)]To study the basic definition, concepts of outer measure of sets, Measurable sets, σ algebra.
-)]To study measurable functions and their properties.
-)]To demonstrate the understanding of the fundamental integral convergence theorems and its applications.
-)]To understand the requirement of Lebesgue integral and its difference from Riemann integral along with its properties.

BHMTM 505 (B) OPTIMIZATION TECHNIQUES

The Primary objective of this course is

-)]To demonstrate the network models and to learn the various algorithms for their solution.
-)]To learn the sensitivity analysis which helps to measure the impacts of fluctuations in the parameters of Mathematical model or system on the outputs of the system.
-)]To gain the knowledge about integer programming problem which is helpful in real life problems.

BHMTM 601 COMPLEX ANALYSIS

The Primary objective of this course is

-)]To understand the concept of differentiability and analyticity for function of complex variable.
-)]To learn the role of Cauchy Goursat theorem and Cauchy integral formula in evaluation of contour integrals.
-)]To enable the students to apply Liouville's theorem in fundamental theorem of algebra.
-)]To understand the convergence of a power series and its convergence.

BMHTM 602 LINEAR ALGEBRA

This course aims to impart the knowledge of vector spaces, dependence and independence of vectors, concepts of basis and dimensions, linear transformations and their relation with matrices.

On completion of this course, the student will be able to

-)]Understand the concept of vector spaces, subspaces, bases, dimension and their properties.
-)]Understand the relationship between matrices & linear transformations and their applications.
-)]Learn properties of Rank & Nullity and realize the importance of linear transformation and its canonical form.

BMHTH 602 DYNAMICS

The Primary objective of this course is

-)]To familiarize the concept of motion with constant acceleration and freely falling body.
-)]To know about the inclined motion and variable acceleration.
-)]To understand the concept of S.H.M and curvilinear motion.
-)]To familiarize the concept of Linear momentum, angular momentum, conservation of angular momentum, impulsive forces, principle of impulse and momentum.

BMHTH 603 METRIC SPACES

The Primary objective of this course is

-)]To introduce the students to the definition of basic terms and concepts in metric space.
-)]To provide students with systematic proofs of theorems using the definitions of basic terms and properties of metrics.
-)]To treat the various basic concepts of open sets, limit points, convergent and Cauchy convergent sequences, complete spaces, compactness and connectedness etc. to the students.

BHMTH 604(B) LINEAR INTEGRAL EQUATIONS AND VARIATIONAL PROBLEMS

The Primary objective of this course is

-)]To familiarize with linear integral equation of first and second kind
-)]To learn to obtain differential equation and Volterra equation from each other.
-)]To understand Fredholm's solution of integral equation for different values of determinants.
-)]To know about symmetric kernel, Schwarz's Inequality and its applications.
-)]To understand the formulation of variational problems, the variation of a functional and its properties, extremum of functional, necessary condition for an extremum.

BHMTH 605(I) ALGEBRAIC CODING THEORY

The Primary objective of this course is

-)]To get an insight into matrix representation of a code as well as encoding and decoding.
-)]To understand Hamming codes, BCH codes.
-)]To learn about cyclic codes and their generator polynomial.
-)]To understand the construction of binary codes in different ways and error detection and correction by various methods.

BHMTH 605 (II) PROBABILITY AND INFERENCE STATISTICS

The Primary objective of this course is

-)]To understand the difference between discrete and continuous distributions.
-)]To understand the concept of sampling distributions.
-)]To learn about applications of t and F and chi square test in daily life.

B.Sc. CSM (Computer, Statistics and Mathematics)

Programme Outcomes:

- PO1.** Create deep interest in learning mathematics, Statistics and computer science.
- PO2.** Enhance the ability to apply the knowledge of Mathematics, Computer Science and to design and conduct experiments, as well as to analyze and interpret data.
- PO3.** Familiarize the students with suitable tools of statistical and mathematical analysis to handle issues and problems in related sciences.
- PO4.** Enhance the ability to acquire required programming skills, formulate and solve practical problems.
- PO5.** Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in mathematics, statistics & computer science and its allied areas on multiple disciplines concerned with mathematics, statistics and computing.
- PO6.** Encourage the students to develop a range of generic skills helpful in employment, internships and social activities.

Programme Specific Outcomes:

PSO1. Students completing this programme will be able to present mathematics, statistics and computing clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, statistics & computers and describe related ideas from multiple perspectives.

PSO2. The students will acquire the skills to use various sampling techniques, statistical inference, data analysis in MS-Excel, implementation of numerical algorithms by using various programming languages.

PSO3. This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various public and private enterprises, and help students to qualify JAM, NBHM, CAT, UPSC etc.

PSO4. Strengthen the mathematical ability & computing knowledge, abstract intelligence and orient themselves towards higher mathematics, statistics, computing and research.

COURSE OUTCOMES

BCSM-101: ALGEBRA AND TRIGONOMETRY

Course Learning Outcomes:

On completion of this course, the student will be able to

CO-1. Learnt methods to solve the equations.

CO-2. Recognize consistent and inconsistent systems of linear equations by the row echelon form of the matrices.

CO-3. Understand how to find eigenvalues and corresponding eigenvectors for a square matrix.

CO-4. Apply De Moivre's Theorem to solve numerical problems.

BCSM-102: DIFFERENTIAL CALCULUS

Course Learning Outcomes:

On completion of this course, the student will be able to

CO-1. Apply the functions of one variable for differential calculus in real life.

CO-2. Understand the concept of the nth order derivative with and without using Leibnitz theorem.

CO-3. Familiarize with concavity, convexity and Asymptotes.

CO-4. Understand and apply the concept of two or more variables for differential calculus in real life.

BCSM 103: DESCRIPTIVE STATISTICS AND INTRODUCTORY PROBABILITY

Course Learning Outcomes:

On completion of this course, the student will be able

CO-1. To learn various techniques for graphical representation of data.

CO-2. To understand the concept of correlation and regression of data.

CO-3. To study the basic concepts of data collection and its analysis.

CO-4. To learn the four descriptive measures of frequency distribution: Central tendency, Dispersion, Skewness and Kurtosis.

BCSM 105: FUNDAMENTALS OF INFORMATION TECHNOLOGY**Course Learning Outcomes:**

On completion of this course, the student will be able to

CO-1. Understand the various number system techniques and its conversion.

CO-2. Understand the basic concepts of hardware & software, terminology and use of IT tools.

CO-3. Understand the concept of word processor, presentation and spreadsheet.

CO-4. Understand the concept of Operating system and various Office Automation tools.

BCSM 106: PROGRAMMING USING C**Course Learning Outcomes:**

After completion of this course students will able to

CO-1. Understand the basic terminology used in computer programming.

CO-2. Describe various Data types, Operators, Control structures, Function in C.

CO-3. Understand the concepts of different user-defined data types such as Arrays, Strings, Structures, and Unions etc.

CO-4. Learn Pointers and File handling techniques.

BCSM 107: SOFTWARE LAB-I (BASED ON BCSM 105 & BCSM 106)**Course Learning Outcomes:**

After completion of this course students will able to:

CO-1. Prepare documents, spreadsheets, make small presentations with audio, video, graphs, charts and animations.

CO-2. Create, edit, save and print documents with list tables, header, footer, graphic, spell checker, mail merge and grammar checker.

CO-3. Describe basics, various Data types, Operators, Control structures, Function in C.

CO-4. Understand the concepts of different user-defined data types such as Arrays, Structures, Pointers and File Handling etc.

BCSM 201: SEQUENCE AND SERIES**Course Learning Outcomes:**

On completion of this course, the student will

CO-1. Assimilate the notions of limit of a sequence and convergence of a sequence of real numbers.

CO-2. Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.

CO-3. Capable of testing convergence and divergence of infinite series of real numbers.

CO-4. Have knowledge of different kinds of tests for convergence/ divergence.

BCSM 202- PLANE AND SOLID GEOMETRY**Course Learning Outcomes:**

On completion of this course, the student will

CO-1. Be aware of the applications of plane and solid geometry.

CO-2. Understand properties of ellipse, parabola and hyperbola and their properties.

CO-3. Be well-versed with sphere & cone and their properties.

BCSM 203: DISTRIBUTION THEORY**Course Learning Outcomes:**

On completion of this course, the student will be able

CO-1. To understand the concept of random variables, probability mass function, probability density function.

CO-2. To understand various discrete and continuous distributions.

CO-3. To understand the applications of Central Limit Theorem.

BCSM 205: DATA STRUCTURES

Course Learning Outcomes:

After completion of this course students will able to:

CO-1. Access the choices of data structure and how it impact the performance of the programs.

CO-2. Describe the basic concept and implementation of various Data Structures.

CO-3. Solve problems based upon different data structures to develop the software.

CO-4. Design new algorithms or modify existing ones for new applications and able to analyze the Space and time efficiency.

BCSM 206: DATABASE MANAGEMENT SYSTEM

Course Learning Outcomes: After completion of this course students will able to:

CO-1. Gain a good understanding of the architecture and functioning of database management systems, principles of data modelling.

CO-2. Design ER-models to represent simple database application scenarios and Convert the ER-model to relational tables.

CO-3. Design database and improve the database design by normalization.

CO-4. Understand the use of structured query language and its syntax, transactions, database recovery and techniques in MySQL.

BCSM 207: SOFTWARE LAB-II (BASED ON BCSM 205 & BCSM 206)

Course Learning Outcomes

After completion of this course student will able to:

CO-1. Implement various Linear and Non-linear Data Structures.

CO-2. Solve problems based upon different data structures to develop the software.

CO-3. Understand basic concepts of storing information in database via tables and SQL syntax used with MySQL.

CO-4. Learn how to retrieve, manipulate, filter, update and insert data.

B.SC (CSM) PART-II (SEMESTER III)

BCSM-301: Integral Calculus

Course Objectives:

-) To analyze and find integral of hyperbolic function, rational function, trigonometric function and logarithmic function.
-) To understand the concept of Improper Integral and multiple integral.
-) To understand the concept of partition and fundamental concept of Riemann Integrability.

BCSM-302: Differential Equations-I

Course Objectives: The Primary objective of this course is

-) To know about solutions of first and higher order differential equations.
-) To exhibit the techniques for obtaining solutions to ordinary differential equations.
-) To investigate the qualitative and quantitative behavior of solutions of system of differential equations.
-) To develop interests in solving a number of problems related to model natural phenomena, engineering systems and many other situations.

BCSM-303: Statistical Inference- I

Course Objectives: Course Objective for the Statistical Inference is

1. The aim is to teach students to formulate the null and alternative hypothesis regarding a population.
2. To make the students capable of performing tests of hypothesis as well as to calculate confidence interval for population parameter.
3. To understand the concept of p-value.

BCSM-304: Applied Statistics

Course Objective: Course Objective for the applied statistics is:

1. The objective is to equip the students with various forecasting techniques and knowledge on modern statistical methods to analyze the time series data.
2. To make students identifying the components of a time series and be able to isolate them.
3. Fitting different time series and demand Analysis models.

BCSM-306: Web Technologies

Course Objective

The objective of the course is to understand the basics of Web Technologies and to make students capable of designing websites.

Course Learning Outcomes:

After completion of this course students will able to:

CO1: Understand basics of internet technologies and HTML.

CO2: Design a media-rich dynamic websites using text, fonts, colors, images, tables, hyperlinks and client side scripting.

CO3: Explore the different platforms and hypertext languages.

CO3: Learn to connect websites with databases and basic operations.

BCSM-307: Computer Networks and Data Communication

Course Objective

The objective of the course is to understand the basics of Computer Networking and to make students aware of the network management and how networking actually takes place.

Course Learning Outcomes:

After completion of this course students will able to:

CO1: Describe how communication works in computer networks and to understand the basic terminology of computer networks.

CO2: Figure out the Reference Models in Networking and communication media.

CO3: Analyse the role of switching and different protocols in networking.

CO4: Learn about the networking devices and remote file access.

(SEMESTER IV)

BCSM-401: Real Analysis

Course Objectives:

-) This course is designed to provide knowledge about Riemann integrals and convergence. Their applications are also included to clear the topic to students.
-) The aim of this course is to make the students familiar with the use of vectors and vector calculus so that they may employ the same in an effective manner to various applications in science subjects and to exhibit the techniques of solving ordinary and partial differential equations.
-) To understand the concept of sequence and series of functions.

BCSM-402: Differential Equations-II

Course Objectives: The Primary objective of this course is

-) To know about solutions of first and higher order partial differential equations.
-) To exhibit the techniques for obtaining solutions to ordinary differential equations.
-) To investigate the qualitative and quantitative behavior of solutions of system of differential equations.
-) To develop interests in solving a number of problems related to model natural phenomena, engineering systems and many other situations.
-) To understand how to extract information from partial derivative models in order to interpret reality.
-) To identify real phenomena as models of partial derivative equations.
-) To apply the concepts of the course in real life problems.

BCSM-403: Statistical Inference- II

Course Objective: Course Objective for the statistical inference-II is:

1. To make students be able to estimate unknown parameters of a population.
2. To make students be able to obtain inferences about a population when sample size is large.
3. To check the significance of a null hypothesis against an alternative hypothesis.

BCSM-404: Industrial Statistics

Course Objective: The course Objective for the subject is

-) To form good statistics practitioner in the belief that the application of Statistics in Industrial setting requires a practical more than a theoretical approach.

BCSM-406: Python Programming

Course Objective

The objective of the course is to understand the basics of Python Programming and to make students capable enough to do programming with Python.

Course Learning Outcomes:

After completion of this course students will able to:

CO1: Describe Object oriented programming concepts in Python.

CO2: Explain various Data types, Control Structures, Functions, Modules and Sequence in Python.

CO3: Understand and summarize the different File handling operations.

CO4: Interpret the concept of Exception Handling in Python

BCSM-407: Operating System

Course Objective

The objective of the course is to understand the basics of Operating System and to make students aware of the CPU scheduling.

Course Learning Outcomes:

After completion of this course students will able to:

CO1: Describe different types of operating systems along with concept of filesystems and CPU scheduling algorithms used in operating system.

CO2: Develop deadlock handling algorithms and learn Memory management.

CO3: Implement various algorithms required for management, scheduling, allocation and communication used in operating system.

CO4: Describe and analyze the memory management, storage management and its policies

SEMESTER V

BCSM 501: ABSTRACT ALGEBRA

Course Learning Outcomes:

On completion of this course, the student will be able to

- CO-1. Link the fundamental concepts of groups and symmetries of geometrical objects.
- CO-2. Explain the significance of the notions of cosets, normal subgroups, and factor groups.
- CO-3. Understand the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains, and fields.
- CO-4. Learn the concept of Homomorphism and Isomorphism in Groups and Rings.

BCSM 502(I): DISCRETE MATHEMATICS

Course Learning Outcomes:

On completion of this course, the student will be able to

- CO-1. Learn about partial ordered set and applications.
- CO-2. Understand about Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.
- CO-3. Understand concepts of various graphical concepts and familiarize with their applications.

BCSM 502(II) LAPLACE AND FOURIER TRANSFORMS

Course Learning Outcomes:

On completion of this course, the student will

- CO-1. Have Knowledge about piece wise continuous functions, Dirac delta function, Laplace transforms and its properties.
- CO-2. Be familiarized with Fourier transforms of functions belonging to class, relation between Laplace and Fourier transforms.
- CO-3. Recognize of the concepts of the course in real life problems.

BCSM 503: LINEAR PROGRAMMING

Course Learning Outcomes:

On completion of this course, the student will be able to

- CO-1. Understand how to analyze and solve linear programming models in real life situations.
- CO-2. Provide graphical solutions to linear programming problems in two variables.
- CO-3. Know about the relationships between the Primal and Dual problems
- CO-4. To acquaint to students to Transportation, Assignment and game theory along with their applications.

BCSM 505(i): SAMPLE SURVEYS

Course Learning Outcomes:

After completion of this course students will able to:

- CO-1. Differentiate between complete census and sample.
- CO-2. Learn about sampling and non-sampling errors.
- CO-3. Understand the principle of Sample Surveys.
- CO-4. Understand the concept of Simple random sampling, Stratified sampling, Ratio and Regression method of sampling.

BCSM 505 (ii): VITAL STATISTICS

Course Learning Outcomes:

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

- CO-1. Measures Fertility rate, Mortality rate, Gross and Net Reproduction Rate.
- CO-2. Understand the construction of Life Tables and its uses.
- CO-3. Understand the concept of Stationary and Stable Population.

BCSM 506: STATISTICS LAB-V(B) (Based on BCSM 505) (Option i)

Course Objectives:

The Primary objective of this course is

-) To draw a random sample using various techniques.
-) To understand SRS with and without replacement.
-) To see the efficiency of Simple random sampling, Stratified sampling, Ratio and Regression estimation.
-) To learn about the applications of various numerical methods.

BCSM 506: STATISTICS LAB-V(B) (Based on BCSM 505) (Option ii)

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

-) Measures Fertility rate, Mortality rate, Gross and Net Reproduction Rate.
-) the construction of Life Tables and its uses.
-) Stationary and Stable Population.

BCSM 507(i): E-COMMERCE

Course Learning Outcomes: After completing this course the students will be able to:

- CO-1. Understand the concept of E-Commerce and the importance of the Internet & WWW.
- CO-2. Classify E-Commerce models.
- CO-3. Understand online marketing and its different models.
- CO-4. Familiarize with E-Payment systems, Mobile Commerce, E-Business portals.

BCSM 507(ii): Cloud Computing

Course Learning Outcomes: After completion of this course students will be able to:

- CO-1. Apply the fundamental concepts in cloud infrastructure to understand the single and multiple data centres.
- CO-2. Outline the role of hardware and software for third party.
- CO-3. Analyse the various cloud computing techniques to solve the problems on the cloud.
- CO-4. Meet the evolution, its applicability, benefits as well as current and future challenge.

BCSM 508: JAVA PROGRAMMING

Course Learning Outcomes: After completion of this course the students will be able to:

- CO-1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
- CO-2. Identify classes, objects, members of a class and the relationships among them needed for finding the solution to specific problem.
- CO-3. Demonstrate how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
- CO-4. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

BCSM 509: SOFTWARE LAB-V (BASED ON BCSM 508)

Course Objective

The aim of this course is to enable students to develop robust and faster object-oriented applications using the concepts of multithreading and exception handling.

Course Learning Outcomes

After completion of this course the students will be able to:

- CO1:** Implement Object Oriented programming concept of control Structures, strings and function for developing the logic building activity using Java.
- CO2:** Identify classes, objects, members of a class and the relationships among them needed for finding the solution of problems by designing the programs.
- CO3:** Implement programs related to reusability using inheritance, interfaces and packages.

CO4: Design and implement programs of exception handling mechanisms and multithreading for efficient application development.

BCSM 601: LINEAR ALGEBRA

Course Learning Outcomes: On completion of this course, the student will be able to
CO-1. Understand the concept of vector spaces, subspaces, bases, dimension and their properties.
CO-2. Understand the relationship between matrices & linear transformations and their applications.

CO-3. Learn properties of Rank & Nullity and realize the importance of linear transformation and its canonical form.

BCSM 602(i): MECHANICS

Course Learning Outcomes: On completion of this course, the student will be able to
CO-1. Familiarize with subject matter, which has been the single center, to which were drawn Mathematicians, physicists, astronomers, and engineers together.

CO-2. Understand the necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body and their applications.

CO-3. Familiarize the concept of motion with constant acceleration and freely falling body and their applications.

CO-4. Know about the inclined motion and variable acceleration and their applications and understand the concept of Simple Harmonic Motion and curvilinear motion and their applications.

BCSM 602 (ii): COMPLEX ANALYSIS

Course Learning Outcomes: On completion of this course, the student will be able to
CO-1. Understand the significance of differentiability and analyticity of complex functions leading to the Cauchy Riemann equations.

CO-2. Learn the role of Cauchy Goursat theorem and Cauchy integral formula in evaluation of contour integrals. Understand how to apply Liouville's theorem in fundamental theorem of algebra.

CO-3. Understand the convergence, term by term integration and differentiation of a power series and learnt Taylor and Laurent series expansions of analytic functions.

CO-4. Classify the nature of singularity, poles and residues and application of Cauchy Residue theorem.

BCSM 603: COMPUTER ORIENTED NUMERICAL METHODS

Course Learning Outcomes: On completion of this course, the students learnt

CO-1. Appropriate numerical methods to solve algebraic and transcendental equations.

CO-2. To find numerical solutions of system of linear equations.

CO-3. How to study Interpolation Methods and its applications.

CO-4. To apply various numerical methods in real life problems.

BCSM 605(i): ANALYSIS OF VARIANCE AND DESIGN OF EXPERIMENTS

Course Learning Outcomes: On completion of this course, the student will be able

CO-1. To understand the concept of one way and two way ANOVA.

CO-2. To understand the fundamental concepts of design of experiments.

CO-3. To understand the completely randomized design, Randomized block design, Latin square design and to learn about the applications of various factorial design.

CO-4. The use and application of various factorial design.

BCSM605 (ii): Optimization Techniques

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

CO-1. Understand the concept of Integer programming.

- CO-2. Understand the concept of Sensitivity analysis.
- CO-3. Draw Network and find minimal spanning tree.
- CO-4. Assign the n jobs on 2 machines, 3 machines.
- CO-5. Assign the 2 jobs on m machines.

CSM 607(i): Advanced Database Management System

Course Learning Outcomes: After completion of this course students will able to:

- CO1:** Understand and explore the underlying principles of Relational Database Management System.
- CO2:** Understand the concept of a database transaction and related database facilities, including concurrency control, backup and recovery, and data object locking and protocols.
- CO3:** Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- CO4:** Implement and maintain an efficient database system using emerging technologies and tools.

BCSM 607(ii): CONTENT MANAGEMENT SYSTEM

Course Learning Outcomes: After completion of this course students will able to:

- CO1:** Understand the need of content management system and various tools for it.
- CO2:** Study the basics of Word Press and cPanel.
- CO3:** Learn to install and customize different plugins.
- CO4:** Explore the advanced Word Press features.

BCSM 608: SOFTWARE ENGINEERING

Course Learning Outcomes: After completion of this course students will be able to:

- CO1:** Analyse software development process models, including spiral model and traditional models like waterfall.
- CO2:** Apply software life cycle through requirements gathering, choice of process model and design model for developing projects.
- CO3:** Acquire knowledge about software estimation techniques and configuration management for creating project baselines.
- CO4:** Perform various activities like implementing, testing and maintenance.

BCSM 609: SOFTWARE LAB-VI (Based on BCSM 607(i): Advanced Database Management System)

Course Learning Outcomes: After completion of this course students will able to:

- CO1:** Explore, organize, maintain and retrieve the data from Oracle effectively and efficiently.
- CO2:** Use a SQL interface of a relational DBMS package to create, secure, maintain, and query a database.
- CO3:** Write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- CO4:** Formulate query, using SQL, solutions to a broad range of query and data update Problems.

BCSM 609: SOFTWARE LAB VI

BASED ON BCSM 607(ii): Content Management System

Course Learning Outcomes: After completion of this course students will able to:

- CO1:** Install different CMS tools and understand the use of cPanel for websites.
- CO2:** Add different type of content in the website and maintain it.
- CO3:** Add extended functionalities and manage users and profile.
- CO4:** Learn protection scheme, backup and restoration of database and files.

Paper I: ALGEBRA AND TRIGONOMETRY

Course Objective:

The objective of the course is to help the students to acquire the skills to do the basic calculations like finding roots using different methods, solving simultaneous linear equations and solving trigonometric problems easily.

Course Learning Outcomes:

On completion of this course, the student will be able to

CO-1. Learnt methods to solve the equations.

CO-2. Recognize consistent and inconsistent systems of linear equations by the row echelon form of the matrices.

CO-3. Understand how to find eigenvalues and corresponding eigenvectors for a square matrix.

CO-4. Apply De Moivre's Theorem to solve numerical problems.

Paper II: DIFFERENTIAL CALCULUS

Course Objective: To impart knowledge about the concepts of functions of more than one variable and their differential calculus.

Course Learning Outcomes:

On completion of this course, the student will be able to

CO-1. Apply the functions of one variable for differential calculus in real life.

CO-2. Understand the concept of the nth order derivative with and without using Leibnitz theorem.

CO-3. Familiarize with concavity, convexity and Asymptotes.

CO-4. Understand and apply the concept of two or more variables for differential calculus in real life.

Paper III: SEQUENCE AND SERIES

Course Objective: This course aims to enable students to study the nature of sequences & series and make them comfortable to study the convergence or divergence of sequences and series by applying different types of easy and short cut tests.

Course Learning Outcomes:

On completion of this course, the student will be able to

CO-1. Assimilate the notions of limit of a sequence and convergence of a sequence of real numbers.

CO-2. Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.

CO-3. Capable of testing convergence and divergence of infinite series of real numbers.

CO-4. Have knowledge of different kinds of tests for convergence/ divergence.

Paper IV: PLANE AND SOLID GEOMETRY

Course Objective: The aim of this course is to make students to understand the properties of two dimensional as well as three dimensional geometrical figures and their applications.

Course Learning Outcomes:

On completion of this course, the student will

CO-1. Aware of the applications of plane and solid geometry.

CO-2. Understand properties of ellipse, parabola and their properties.

CO-3. Be well-versed with sphere & cone and their properties.

Paper V: Integral Calculus

Course Objectives:

) To analyze and find integral of hyperbolic function, rational function, trigonometric function and logarithmic function.

) To understand the concept of Improper Integral and multiple integral.

) To understand the concept of partition and fundamental concept of Riemann Integrability.

Paper VI: Differential Equations-I

Course Objectives: The Primary objective of this course is

-) To know about solutions of first and higher order differential equations.
-) To exhibit the techniques for obtaining solutions to ordinary differential equations.
-) To investigate the qualitative and quantitative behavior of solutions of system of differentialequations.
-) To develop interests in solving a number of problems related to model natural phenomena,engineering systems and many other situations.

Paper VII: Real Analysis

Course Objectives:

-) This course is designed to provide knowledge about Riemann integrals and convergence. Their applications are also included to clear the topic to students.
-) The aim of this course is to make the students familiar with the use of vectors and vector calculus so that they may employ the same in an effective manner to various applications in science subjects and to exhibit the techniques of solving ordinary and partial differential equations.
-) To understand the concept of sequence and series of functions.

Paper VII: Differential Equations-II

Course Objectives: The Primary objective of this course is

-) To know about solutions of first and higher order partial differential equations.
-) To exhibit the techniques for obtaining solutions to ordinary differential equations.
-) To investigate the qualitative and quantitative behavior of solutions of system of differential equations.
-) To develop interests in solving a number of problems related to model natural phenomena, engineering systems and many other situations.
-) To understand how to extract information from partial derivative models in order to interpret reality.
-) To identify real phenomena as models of partial derivative equations.
-) To apply the concepts of the course in real life problems.

Paper IX: ABSTRACT ALGEBRA

Course Objective: This course aims to make the students of new algebraic structures such as group, ring and their homomorphism.

Course Learning Outcomes:

On completion of this course, the student will be able to

CO-1. Link the fundamental concepts of groups and symmetries of geometrical objects.

CO-2. Explain the significance of the notions of cosets, normal subgroups, and factor groups.

CO-3. Understand the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains, and fields.

CO-4. Learn the concept of Homomorphism and Isomorphism in Groups and Rings.

Paper X (Option I): DISCRETE MATHEMATICS

Course Objective: This course aims to enable the students to understand the concepts of boolean algebra and their relation with switching circuits and graph theory.

Course Learning Outcomes:

On completion of this course, the student will be able to

CO-1. Learn about partial ordered set and applications.

CO-2. Understand about Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.

CO-3. Understand concepts of various graphical concepts and familiarize with their applications.

PAPER X (OPTION II): LAPLACE AND FOURIER TRANSFORMS

Course Objective: The aim of this course is to impart knowledge of Laplace and Fourier transforms and their use to make lengthy calculations easy.

Course Learning Outcomes:

On completion of this course, the student will

- CO-1. Be familiarized with Fourier transforms of functions belonging to \square class, relation between Laplace and Fourier transforms.
- CO-2. Have knowledge about piece wise continuous functions, Dirac delta function, Laplace transforms and its properties.
- CO-3. Recognize of the concepts of the course in real life problems.

Paper XI: LINEAR ALGEBRA

Course Objective: This course aims to impart the knowledge of vector spaces, dependence and independence of vectors, concepts of basis and dimensions, linear transformations and their relation with matrices.

Course Learning Outcomes:

On completion of this course, the student will be able to

- CO-1. Understand the concept of vector spaces, subspaces, bases, dimension and their properties.
- CO-2. Understand the relationship between matrices & linear transformations and their applications.
- CO-3. Learn properties of Rank & Nullity and realize the importance of linear transformation and its canonical form.

Paper XII (Option I): MECHANICS

Course Objective: The main objective of this course is to familiarize the students with basic concepts of statics and dynamics to solve problems related to mechanics so as to make them understand their applications in day to day life.

Course Learning Outcomes:

On completion of this course, the student will be able to

- CO-1. Familiarize with subject matter, which has been the single center, to which were drawn mathematicians, physicists, astronomers, and engineers together.
- CO-2. Understand the necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body and their applications.
- CO-3. Familiarize the concept of motion with constant acceleration and freely falling body and their applications.
- CO-4. Know about the inclined motion and variable acceleration and their applications and understand the concept of Simple Harmonic Motion and curvilinear motion and their applications.

Paper XII (Option II) LINEAR PROGRAMMING

Course Objective: The aim of this course is to enable students to formulate real life problems of maximization as well as minimization under the given constraints and to solve those problems using different methods.

Course Learning Outcomes:

On completion of this course, the student will be able to

- CO-1. Understand how to analyze and solve linear programming models in real life situations.
- CO-2. Provide graphical solutions to linear programming problems in two variables.
- CO-3. Know about the relationships between the Primal and Dual problems
- CO-4. To acquaint to students to Transportation and Assignment along with their applications.