PROGRAMME OUTCOME & COURSE OUTCOMES

PROGRAMME:

B.SC. (HONS.)

(UNDER CBCS SYSTEM)

DEPARTMENT OF MATHEMATICS



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COURSE OUTCOMES OF MATHEMATICS

SEMESTER- I

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH1CC01**	**Calculus, Geometry & Differential Equations**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal. They should understand the connections among these representations.
CO 2	Understand the meaning of the derivative in terms of a rate of change and local linear approximation and should be able to use derivatives to solve a variety of problems.
CO 3	Understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus
CO 4	Model a written description of a physical situation with a function, a differential equation, or an integral.
CO 5	Evaluate definite and indefinite integrals and use them in applications.
CO 6	Explain the relationship between the derivative of a function as a function and the notion of the derivative as the slope of the tangent line to a function at a point
CO 7	Find maxima and minima, critical points and inflection points of functions and to determine the concavity of curves.
CO 8	Understand the canonical form of a curve arises from the general equation of 2^{nd} degree
CO 9	Gain an understanding of polar equations of conics, their tangent, normal, chord of contact etc.
CO 10	Illustrate of graphing standard quadric surfaces like cone, ellipsoid etc.
CO 11	Formulate Differential Equations for various Mathematical models.
CO 12	Solve first order non-linear differential equation and linear differential equations of higher order using various techniques.
CO 13	Apply these techniques to solve and analyze various mathematical models.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH1CC02**	**Algebra**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Represent a complex number in its polar form, prove the associated De-Moivre's Theorem and apply it to solve the related mathematical problems, including the problem of finding the nth roots of unity.
CO 2	Investigate the nature and location of roots and several other properties of an nth degree equation using Descartes' rule of signs, Sturm's Theorem and the relations between its roots and coefficients
CO 3	Transform an equation to a desired form, in particular transform a cubic equation in its standard form and subsequently, can solve a cubic equation by Cardan's Method and a biquadratic equation by Ferrari's method.
CO 4	Solve different types of reciprocal equations.
CO 5	Deal with the problems of inequality involving AM>GM>HM and Cauchy-Schwartz inequality.
CO 6	Handle the properties and related problems of Modern Algebra involving Equivalence relations, Partition of a set, Functions, Composition of functions, Invertible functions, One to one correspondence, Cardinality of a set etc. and keep themselves ready to apply these concepts suitably to advance studies in all branches of science and whenever necessary, to solve some problems of day to day life.
CO 7	Get acquainted with several concepts of Number Theory involving Well-ordering property of positive integers, Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, Principle of Mathematical Induction, Fundamental Theorem of Arithmetic (only statement) etc., solve the related problems and to apply these concepts suitably to advance studies in all branches of science and whenever necessary, to solve some problems of day to day life.
CO 8	Transform a matrix in the row-reduced Echelon form, use the concept to find the rank of a matrix and subsequently to investigate the consistency and roots of a system of linear equations.
CO 9	Compute the inverse of a matrix and investigate the characterizations of invertible matrices.
CO 10	Find the Characteristic Equation of a matrix, prove the Cayley-Hamilton theorem and finally use this theorem to find the inverse of a matrix.
CO 11	Acquire a thorough knowledge of Eigen values and Eigen vectors of a matrix and apply these concepts in other branches of Mathematics and Mathematical Sciences.
CO 12	Get a fair idea about Vector spaces and subspaces, in particular, vector spaces and subspaces of R^n and its dimension.
CO 13	Acquire preliminary knowledge of linear transformations and can represent a linear transformation in terms of a matrix.

SEMESTER- II

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH2CC03**	**Real Analysis**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Investigate the Algebraic and order properties of R , get acquainted with the ideas of countable and uncountable sets including uncountability of R and utilise these concepts in the other branches of higher mathematics.
CO 2	Get fair knowledge of bounded and unbounded sets, suprema and infima, Completeness and its equivalent Properties, Archimedean Property and Density property of R and whenever necessary, utilize these concepts in the other branches of higher mathematics.
CO 3	Investigate different properties of subsets of R, using the concepts of Intervals, neighborhood of a point, interior point, limit point, isolated point of a subset of R, open sets, closed sets, derived sets, compact sets in R, prove Bolzano-Weierstrass Theorem for sets, Heine-Borel Theorem and keep themselves ready to use these concepts in post graduate studies.
CO 4	Deal with the properties of Sequence of real numbers involving the concepts - Limit of a sequence, Limit inferior, Limit superior, Limit Theorems, Monotone Convergence Theorem, subsequences, Monotone subsequence Theorem, Bolzano-Weierstrass Theorem for sequence, Cauchy sequence and Cauchy's Convergence Criterion.
CO 5	Deal with the properties of Infinite Series of real numbers involving the concepts – Convergence & divergence of infinite series, Comparison Tests, Ratio Test, Cauchy's nth root test, Integral test, Alternating series, Leibnitz test and Absolute/Conditional convergence.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH2CC04**	**Differential Equations and Vector Calculus**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Solve differential equations of first order using graphical, numerical, and analytical methods,
CO 2	Solve and apply linear differential equations of second order (and higher)
CO 3	Find power series solutions of differential equations
CO 4	Develop the ability to apply differential equations to significant applied and/or theoretical problems.
CO 5	Solve problems in ordinary differential equations, dynamical systems, stability theory, and a number of applications to scientific and engineering problems
CO 6	Demonstrate their understanding of how physical phenomena are modelled by differential equations.
CO 7	Implement solution methods using appropriate technology
CO 8	Investigate the qualitative behaviour of solutions of systems of differential equations and interpret in the context of an underlying model.
CO 9	Represent vectors analytically and geometrically, and compute dot and cross products for presentations of lines and planes
CO 10	Understand the meaning of vector triple product & application of this
CO 11	Solve various types of differentiation & integration of vector function
CO 12	Build solutions to differential equations by superposition of known solutions
CO 13	Find the complete solution of a non homogeneous differential equation with constant coefficients by the method of undetermined coefficients.

SEMESTER- III

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH3CC05**	**Theory of Real Functions & Introduction to Metric Spaces**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Define Limits, continuity and Uniform Continuity of real functions along with the sequential criterion for the first two, investigate several properties of limits and continuity including intermediate value theorem, Location of roots theorem & preservation of intervals theorem and keep them ready to use these concepts in higher studies of Mathematics and other branches of Science.
CO 2	Get acquainted with the concepts of Differentiability of a function at a point and in an interval, prove the associated theorems, viz., Caratheodory's theorem, Rolle's theorem. Mean value theorems, Darboux's theorem etc., apply these theorems to solve different problems of higher mathematics and as an application of differential calculus, can handle the problems of Curvature.
CO 3	Prove Cauchy's mean value theorem, Taylor's theorem with Lagrange's form of remainder, Taylor's theorem with Cauchy's form of remainder etc., derive Taylor's series, Maclaurin's series expansions of exponential and trigonometric functions, $\ln(1+x)$, $1/(ax+b)$ and $(1+x)^n$ and apply Taylor's theorem to convex functions and to solve inequalities.
CO 4	Get elementary ideas of Metric spaces including the concepts – definition and examples, Open and closed balls, neighbourhoods, open sets, interior of a set, Limit point of a set, closed sets, diameter of a set, subspaces, dense sets, separable spaces etc. and keep themselves ready to apply these ideas in the higher studies of Mathematics and other branches Science.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH3CC06**	**Group Theory I**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Understand the structure of different Groups and their properties and usefulness of such Groups.
CO 2	Understand the concept and properties of Subgroups of a Group with the help of different examples, get clear concepts on special type of Subgroups like centre of a group etc.
CO 3	Know the properties and classification of Cyclic Groups and Permutation Groups.
CO 4	Understand the concept of Cosets and their properties and Lagrange's theorem and it usefulness.
CO 5	Understand the concepts and properties of Normal Subgroups, prove the Cayley's theorems for non-abelian Groups and study its applicability.
CO 6	Know about the Factor Groups and external direct product for finite number of Groups.
CO 7	Get elementary ideas on Homomorphism and Isomorphism of Groups with their properties and prove important theorems based on it.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH3CC07**	**Numerical Methods & Numerical Methods Lab**	**4:0:2**	**6**

Upon successful completion of this course students will be able to:

CO 1	Analyze the error incumbent in any such numerical approximation.
CO 2	Some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of a system of linear equations, up to a certain given level of precision.
CO 3	Interpolation techniques to compute the values for a tabulated function at points not in the table.
CO 4	Applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.
CO 5	Derive numerical methods for approximating the solution of problems of continuous mathematics.
CO 6	Analyze the error incumbent in any such numerical approximation.
CO 7	Implement solution methods using appropriate technology.
CO 8	Implement a variety of numerical algorithms using appropriate technology.
CO 9	Compare the viability of different approaches to the numerical solution of problems arising in roots of solution of non-linear equations, interpolation and approximation, numerical differentiation and integration, solution of linear systems.
CO 10	Write code using for/do loops, while constructions, conditional statements (if, then, else), and make use of logical constructs in the context of mathematics.
CO 11	Identify algorithms with which to solve mathematical problems.
CO 12	Verify the correctness of a solution or decide whether the result is an acceptable approximation to the solution.
CO 13	Write programs from the underlying algorithms, and demonstrate the ability to employ good commenting and coding techniques.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
SEC	**BMH3SEC11**	**Logic And Sets**	**2:0:0**	**2**

Upon successful completion of this course students will be able to:

CO 1	Acquire fair knowledge and understanding in Propositional Logic including the concepts- Propositions, Truth table, Negation, Conjunction, Disjunction, Implications, Bi-conditional propositions, converse, contra positive and inverse propositions, precedence of logical operators etc. and deal with Propositional equivalence and Logical equivalence.
CO 2	Get introductory knowledge of Predicate Logic including the concepts - Quantifiers, Binding variables and Negations.
CO 3	Describe Sets, subsets, finite and infinite sets, empty set, classes of sets, Power set of a set, Venn diagrams, counting principle etc. with proper examples, perform Set operations to establish the laws of set theory and investigate the properties of empty set.
CO 4	Prove Set identities using Difference and Symmetric difference of two sets and establish several laws of set theory using Generalized union and intersections.
CO 5	Describe Relation using Cartesian Product of sets, along with the concepts - Composition of relations, Types of relations, Partitions, Equivalence Relations etc., giving proper examples of each concept.
CO 6	Explain the concepts- congruence modulo relation. Partial ordering relations, n- array relations.

SEMESTER- IV

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH4CC08**	**Riemann Integration and Series of Functions**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Understanding the history and theoretical concept of Integration and its geometrical significance.
CO 2	Understand Partition and refinement of partition of a closed and bounded interval.
CO 3	Visualize Upper Darboux sum $U(P,f)$ and Lower Darboux sum $L(P,f)$ and their relations and their application in Upper integral and Lower integral.
CO 4	Realize Darboux's theorem along with its application for finding integration over a closed and bounded interval.
CO 5	Learn Riemann sum, Riemann's definition of integrability and its Equivalence with Darboux definition of integrability along with the Necessary and sufficient condition for Riemann integrability.
CO 6	Learn that a bounded function on a closed and bounded interval is Riemann integrable if and only if the function is continuous, monotone or no. of points of discontinuity is finite or set of points of discontinuity have finite no. of limit points.
CO 7	Develop the idea of anti-derivative, primitive and some properties of Riemann Integrable function.
CO 8	Understand the Fundamental theorem of Integral Calculus & First Mean Value theorem of integral calculus.
CO 9	Understand in which Range the integration-finite or infinite converges and learn the Necessary and sufficient condition for convergence of improper integral in both cases.
CO 10	Learn the Tests of convergence: Comparison and M-test, absolute and non-absolute convergence, Abel's and Dirichlet's test for convergence on the integral of a product.
CO 11	Know about Beta and Gamma function and learn how to apply it for finding the value of integration.
CO 12	Develop the idea of sequence of functions defined on a set, Pointwise and uniform convergence, Cauchy criterion of uniform convergence, M_n-test, continuity, integrability and differentiability of the limit function of a sequence of functions in case of uniform convergence.
CO 13	Develop the idea of series of functions defined on a set, Pointwise and uniform convergence, Cauchy criterion of uniform convergence, Weierstrass' M-test, Passage to the limit term by term, integrability, differentiability of a series of functions in case of uniform convergence.
CO 14	Understand the concept of power series, Cauchy-Hadamard theorem, how to find the

	radius of convergence, uniform and absolute convergence of power series, Abel's limit theorems, Uniqueness of power series having sum function.
CO 15	Understand the concept of Fourier series, statement of sufficient condition for a trigonometric series to be a Fourier series, Fourier coefficients for periodic functions defined on $[-\pi, \pi]$. Statement of Dirichlet's condition of convergence, Statement of theorem of sum of Fourier series.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH4CC09**	**Multivariate Calculus**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Compute limits, continuity and derivatives of functions of two, three or more variables.
CO 2	The conceptual variations when advancing in calculus from one variable to multivariable discussions.
CO 3	Inter-relationship amongst the line integral, double and triple integral formulations.
CO 4	Evaluate double and triple integrals for area and volume.
CO 5	Evaluate line integrals directly and by the fundamental theorem.
CO 6	Differentiate vector fields.
CO 7	Determine gradient vector fields and find potential functions.
CO 8	Applications of multi variable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.
CO 9	Analyze vector functions to find derivatives, tangent lines, integrals, arc length, and curvature.
CO 10	Relate the surface and volume integral by Gauss divergence theorem.
CO 11	Understand the solenoidal and irrotational vectors.
CO 12	Exhibit the inter dependence of line, surface and volume integrals.
CO 13	Apply the knowledge of some methods in the modeling of various physical and engineering phenomena.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH4CC10**	**Ring Theory and Linear Algebra I**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Understanding the structure of different Rings and their properties. Create concept about the connection between Rings and Groups.
CO 2	Understanding the concept and properties of Subrings, Integral domains and fields and interlink between these and understand the importance of characteristic of a Ring and its usefulness for field.
CO 3	Understanding the concept of Ideals and their structure and also understand its operations and classification, like as prime ideals and maximal ideals and trying to understand the similar concept for normal subgroup of a Group and ideals for a Ring.
CO 4	Creating clean idea on Homomorphism and Isomorphism of Rings with their properties and the important theorems based on it. Also remind the concept for Homomorphism and Isomorphism for Group and see how similar structure they are corresponding to Homomorphism and Isomorphism of Ring.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
SEC	**BMH4SEC21**	**Graph Theory**	**2:0:0**	**2**

Upon successful completion of this course students will be able to:

CO 1	Develop the knowledge of Graphs, Subgraphs, their representations, degree, out-degree, in-degree and algebraic operations, isomorphism of graphs.
CO 2	Develop the knowledge to classify the graph into pseudo graph, complete graph, bipartite graphs, di-graph and to construct electrical circuits using the concept of connectivity of directed graph.
CO 3	Learn to differentiate Eulerian and Hamiltonian graphs by using necessary and sufficient conditions and know Eulerian circuit, Hamiltonian cycle and their related results.
CO 4	Learn matrix representation of graph and classify them into Adjacency matrix and Incidence matrix.
CO 5	Characterize tree, spanning tree, minimum spanning trees and their related results, apply Kruskal's algorithm to construct minimum spanning tree.
CO 6	Develop algorithm for shortest path between two vertices and learn about travelling salesman problem.
CO 7	Emphasise on some of the concepts in graph theory and formulate graph theoretic models to solve real world problems in day today life.

SEMESTER- V

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH5CC11**	**Partial Differential Equations and Applications**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Formulate, classify and transform partial differential equations into canonical form.
CO 2	Solve linear and non-linear partial differential equations using various methods; and apply these methods in solving some physical problems.
CO 3	Be familiar with the modelling assumptions and derivations that lead to PDEs.
CO 4	Recognize the major classification of PDEs and the qualitative differences between the classes of equations.
CO 5	Be competent in solving linear PDEs using classical solution methods.
CO 6	Form a PDE after eliminating constant and arbitrary functions.
CO 7	Reduce a second order PDE to its canonical form and solve it.
CO 8	Apply boundary value conditions to PDE.
CO 9	Use the Fourier series expansion in solving elliptic differential equations.
CO 10	Obtain a solution for diffusion equation using method separation of variables.
CO 11	Obtain a solution of wave equation.
CO 12	Demonstrate various physical models through higher order partial equations and solve such linear partial differential equations.
CO 13	Construct a variety of partial differential equations and solution by exact methods/method of separation of variables.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH5CC12**	**Mechanics I**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Solve problems in the equilibrium of point or rigid bodies.
CO 2	Solve problems of forces in two and three dimensions.
CO 3	Discuss the linear motion of a particle and also for a system of particles.
CO 4	Understand, evaluate and describe the theories, concepts and principles of the current knowledge for a particle and a rigid body.
CO 5	Define angular momentum for a particle and a system of particles.
CO 6	Solve problems in rotational motion and the orbits of planets and other celestial bodies.
CO 7	will demonstrate an ability to apply fundamental rigid-body mechanics concepts to set up and solve problems such as equilibrium and force-balance problems for a rigid body.
CO 8	Define moment of inertia and product of inertia and use it in simple problems.
CO 9	Explain the origin of the Coriolis and centrifugal terms in the equation of motion in a rotating frame.
CO 10	Students will demonstrate an ability to apply skills in mathematics and physics to solve engineering mechanics problems.
CO 11	Master appropriate analytical, theoretical and/or practical techniques to further their understanding and skills in the chosen topic.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
DSE	**BMH5DSE11**	**Linear Programming**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Formulate a given simplified description of a suitable real-world problem as a linear programming model in general, standard and canonical forms.
CO 2	Sketch a graphical representation of a two-dimensional linear programming model given in general, standard or canonical form.
CO 3	Solve a two-dimensional linear programming problem graphically.
CO 4	Use the simplex method to solve small linear programming models by hand, given a basic feasible point.
CO 5	Use the two-phase method to solve linear programming models by hand.
CO 6	Use the Big-M method to solve linear programming models by hand.
CO 7	Know about Duality, formulation of dual problem, primal dual relationship, etc.
CO 8	Use the Dual Simplex method to solve linear programming models by hand.
CO 9	Be able to identify the special features of the transportation problem.
CO 10	Become familiar with the types of problems that can be solved by applying a transportation model.
CO 11	Be able to develop network and linear programming models of the transportation problem.
CO 12	Know how to handle the cases of (1) unequal supply and demand, (2) unacceptable routes, and (3) maximization objective for a transportation problem.
CO 13	Be able to identify the special features of the assignment problem.
CO 14	Become familiar with the types of problems that can be solved by applying an assignment model.
CO 15	Be able to develop network and linear programming models of the assignment problem.
CO 16	Be able to identify the special features of the assignment problem.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
DSE	**BMH5DSE21**	**Probability & Statistics**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Compute probabilities and conditional probabilities in appropriate ways.
CO 2	Use various methods to compute the probabilities of different types of events.
CO 3	Analyze and interpret statistical data using appropriate probability distributions, e.g. binomial, Poisson and normal.
CO 4	Perform a regression analysis, and compute and interpret the coefficient of correlation.
CO 5	Organize, present and interpret statistical data, both numerically and graphically.
CO 6	Apply central limit theorem to describe inferences.
CO 7	Identify and demonstrate appropriate sampling and data collection processes.
CO 8	Classify variables as quantitative or categorical, create appropriate numerical and graphical summaries for each type, and use these to explain/identify relationships between variables.
CO 9	Explain and successfully apply the Central Limit Theorem appropriately to describe inferences using normal distributions.
CO 10	represent and statistically analyze data both graphically and numerically.
CO 11	Explain and successfully apply all aspects of appropriate non-parametric tests.
CO 12	Construct and interpret confidence intervals to estimate means, standard deviations and proportions for populations.
CO 13	Explain and successfully apply all aspects of parametric testing techniques including single and multi-sample tests for mean and proportion.

SEMESTER- VI

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH6CC13**	**Metric Spaces and Complex Analysis**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Develop a clear concept about definition and examples of metric spaces, open ball, open set, closed set as complement of open set, interior point and interior of a set, limit point and closure of a set, boundary point and boundary of a set, diameter of a set, distance between two sets and Subspace of a metric space.
CO 2	Expand their knowledge from Real space to Metric space about convergent sequences, Cauchy sequences and their properties.
CO 3	Acquire a thorough knowledge of Complete metric space, Incomplete metric space and their examples, properties, comes to know Cauchy sequences may not converge and Cantor's intersection theorem.
CO 4	Understand the extension of Continuous mappings, sequential criterion of continuity, Uniform continuity from real space to metric space.
CO 5	Understand Compactness, Sequential compactness, Heine-Borel theorem in R, Finite intersection property, continuous functions on compact sets, relation between compactness and uniform continuity.
CO 6	Develop their concept of connectedness and some examples of connected metric space, connected subsets of R, C, any interval in Real is connected.
CO 7	Understand Contraction mappings, Banach Fixed point Theorem and its application to ordinary differential equations.
CO 8	Develop the concepts of derivative, differentiability and analytic functions and will be familiar with the elementary complex functions, their properties,Cauchy-Riemann equations and sufficient condition for differentiability.
CO 9	Get acquainted with several concepts of power series, Cauchy-Hadamard theorem, determination of radius of convergence, Uniform and absolute convergence of power series, analytic functions represented by power series, uniqueness of power series.
CO 10	Understand the concept of contours, complex integration along a contour and its examples, upper bounds for moduli of contour integrals, ML-inequality, Cauchy-Goursat theorem (statement only) and its consequences, Cauchy integral formula.
CO 11	Represent functions as Taylor, power and Laurent series, Compute Laurent series and its examples
CO 12	Students will demonstrate the ability of different problems on metric space and some important theorem on complex analysis by presentation.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
CC	**BMH6CC14**	**Ring Theory and Linear Algebra II**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Get acquainted with Fundamental concepts of Polynomial rings over commutative rings, Division Algorithm and their consequences.
CO 2	Understand several applications on Factorization of polynomials, Reducibility and Irreducibility Tests including Eisenstein criterion and Unique Factorization in $\mathbb{Z}[x]$.
CO 3	Develop ideas on Divisibility in Integral Domains; Irreducible, Prime and Unique Factorization Domains including Euclidean Domains.
CO 4	Develop a clear concept about definition and examples of Dual Spaces, Dual Basis and Double Dual.
CO 5	Expand their knowledge upto the Transpose of a Linear Transformation and its matrix representation in Dual Basis alongwith the concepts of Annihilators, Eigen spaces of a Linear Operator and Diagonalisability.
CO 6	Acquire a thorough knowledge of Invariant Subspaces and Cayley-Hamilton theorem including the idea of minimal polynomial for a Linear operator and their Canonical forms.
CO 7	Get a fair knowledge about definition and examples of Inner Product Spaces, Norms and Gram-Schmidt Process of Orthogonalisation and Orthogonal complements as their consequences.
CO 8	Understand Bessel's Inequality and the adjoint of a linear operator, and expand the idea to Least square approximation and Minimal solution to systems of linear equations as an application.
CO 9	Get acquainted with the idea of Normal and Self-adjoint operators, Orthogonal Projections and deal with Spectral theorem.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
DSE	**BMH6DSE33**	**Group theory II**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Have some idea about Automorphism, Characteristic Subgroup, Commutator Subgroup and their properties.
CO 2	Develop ideas on Automorphism groups of finite and infinite cyclic groups.
CO 3	Solve problems on the application of Factor groups to Automorphism groups.
CO 4	Develop ideas on External and Internal Direct Products, including Fundamental theorem of Abelian Groups and its underlying properties.
CO 5	Obtain some fair knowledge about Group action and its associated topics.
CO 6	Learn different applications of Group action including Generalised Cayley's Theorem and Index Theorem.
CO 7	Get acquainted with fundamental concepts of Conjugation, class equations and their consequences including the concept of conjugacy in S_n.
CO 8	Understand the concept of p-groups, Sylow's theorems and their consequences.
CO 9	Demonstrate Cauchy's theorem as an application of Sylow's theorem, Simplicity of A_n $(n \geq 5)$ and non-simplicity tests.

COURSE OUTCOMES OF MATHEMATICS

Course Type	Course Code	Name of the Course	Credit Pattern (L:T:P)	Credit
DSE	**BMH6DSE43**	**Mechanics II**	**5:1:0**	**6**

Upon successful completion of this course students will be able to:

CO 1	Demonstrate knowledge of fundamental concepts of Mechanics.
CO 2	Verify the law of Moments using Parallel Force apparatus and to verify the law of Force Polygon.
CO 3	Design and analyze problems relating to real world kinematics.
CO 4	To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.
CO 5	Interpret the physical meaning of different terms in the deformation tensor.
CO 6	List and explain the assumptions behind the classical equations of fluid dynamics.
CO 7	Identify and formulate the physical interpretation of the mathematical terms used in solutions to fluid dynamics problems.
CO 8	Write and manipulate fluid dynamics equations using tensor (indicial) notation.
CO 9	List and apply the basic assumptions used in fluid dynamics.
CO 10	Find CG and moment of Inertia of an irregular body using Computation method.