DEPARTMENT OF MATHEMATICS

B.Sc. Mathematics(Model 1)

Core

SEMESTER 1

MM1CRT01	Foundations of Mathematics	Credits: 3
CO1	Discuss mathematical statements	
CO2	Analyse mathematical statements using truth tables	
CO3	Explain the idea behind construction of proofs	
CO4	Discuss sets and functions	
CO5	Analyse different properties of relations	
CO6	Describe different methods to find roots of an equation.	
CO7	Analyse the appropriate methods to find the solution of a cubic equation	

SEMESTER 2

MM2CRT02	Analytic, Geometry, Trigonometry and Differential Calculus	Credits: 3
CO1	Find equation of tangents and normal of a conic	
CO2	Evaluate chords of a given conic	
CO3	Explain polar coordinates	
CO4	Describe equation of lines, circles and conics in polar coordinates	
CO5	Understand the idea of circular and hyperbolic functions	
CO6	Find the real and imaginary parts of functions of complex variables	
CO7	Find the summation of some infinite series	
CO8	Evaluate successive differentiation	
CO9	Solve indeterminate forms	

SEMESTER 3

MM3CRT01	Calculus	Credits: 4
CO1	Analyse the expansion of functions using Maclaurin's theorem and Taylor's theorem.	
CO2	Explain concavity, points of inflexion, curvature, evolutes, length of arc as a function derivatives of arc	
CO3	Describe radius of curvature, evolutes and involutes, properties of evolutes, asymptotes and envelopes.	
CO4	Solve partial derivatives and Lagrange multipliers.	
CO5	Determine volume of surface using different methods.	
CO6	Determine arc length and areas of surface of revolution	

CO7	Discuss examples to find area using double integration
CO8	Determine the volume of a surface using triple integrals in cylindrical and spherical coordinates.

SEMESTER 4

MM4CRT01	**Vector Calculus, Theory of Numbers and Laplace Transform**	**Credits: 4**
CO1	Analyse vector functions.	
CO2	Describe line integrals, vector fields and line integrals, path independence.	
CO3	Discuss Green's theorem, Stokes' theorem, Divergence theorem.	
CO4	Illustrate examples to find the arc length and curvature.	
CO5	Illustrate examples to verify Green's theorem, Stokes' theorem and Divergence theorem.	
CO6	Describe properties of congruence, Fermat's theorem, Wilson's theorem and Euler- Phi function	
CO7	Explain Laplace transform, linearity and existence of Laplace transform, convolution and integral equations.	
CO8	Solve initial value problem.	

SEMESTER 5

MM5CRT01	**Mathematttical Analysis**	**Credits: 4**
CO1	Define Real number system, finite and infinite set, function, limit of a function, absolute value, Intervals and real line	
CO2	Explain the algebraic, completeness and order properties of real number, supremum and infimum of a set	
CO3	Define sequence and their limits, subsequence, monotone sequence, series and their examples	

CO4	Define convergence and divergence of a sequence and test whether a given sequence is convergent or not.
CO5	Explain theorems based on Sequences and series
CO6	Discuss about absolute convergence and non absolute convergence of a series.
CO7	Analyse the concept of limit of functions, its theorems and extension
CO8	Compute the limit of a given function at a point

MM5CRT02	**Differential Equations**	**Credits: 4**
CO1	Analyse the nature of differential equations	
CO2	Solve and apply the solution of first second and higher order differential equations	
CO3	Explain the idea behind the orthogonal trajectory and families of curves	
CO4	Discuss the concepts of solution of a differential equation and the power series solution	
CO5	Analyse the power series method to solve the differential equations	
CO6	Develop the ability to apply the solution of the differential equation in theoretical and practical problems	
CO7	Analyse the concepts of partial differential equations and its solutions	

MM5CRT03	**Abstract Algebra**	**Credits: 4**
CO1	Recall the concepts of sets, binary operations, number system and permutation	
CO2	Explain the basic concepts about Group, Ring and field and the basic properties of these algebraic structures	
CO3	Construct Group table for finite groups.	

CO4	Discuss various examples to thorough the concepts
CO5	Explain Group Homomorphism by using relationship between groups
CO6	Discuss the basic information about Cyclic group, Alternate group, Permutation Group, Direct product of groups and Cosets
CO7	Extend the concept of group homomorphism to ring homomorphism
CO8	Determine whether a given set with associated operations is a group, ring or field by checking its properties.

MM5CRT04	**Environmental Mathematics and Human Rights**	**Credits: 4**
CO1	Discuss the multidisciplinary nature of environmental studies	
CO2	Explain the role of individual in conservation of natural resources	
CO3	Describe natural resources such as forest resources, water resources, mineral resources, energy resources, land resources, etc.	
CO4	Analyse the concept of ecosystem	
CO5	Define pollution , its causes, effects and measures	
CO6	Explain the importance of Fibonacci numbers in nature	
CO7	Explain Golden ratio	
CO8	Describe human rights	

MM5GET02	Applicable Mathematics – Open Course	Credits: 4
CO1	Explain the concepts in simplification	
CO2	Analyse problems in ration and proportion, percentage, profit and loss	
CO3	Find heights and distance using trigonometry	
CO4	Evaluate simple interest and compound interest.	
CO5	Solve problems in time and work, work and wages and time and distance	
CO6	Discuss exponential series and logarithmic series	
CO7	Find area and perimeter of polygons	
CO8	Solve problems on simple factorisation of quadratic and cubic polynomials	

SEMESTER 6

MM6CRT01	Real Analysis	Credits: 4
CO1	Identify the continuous functions as a very special class of functions that arises in real analysis. Understand the concept of continuity and establish the fundamental properties of continuous functions	
CO2	Distinguish the concepts continuity and uniform continuity. Also explain the sufficient condition for uniform continuity. Study on monotone functions that are not necessarily continuous. Illustrations are provided	
CO3	Concentrate on mathematical aspects of derivative and it's applications in geometry, physics and economics	
CO4	Develop the knowledge of Riemann integrability of real valued functions and it's applications	
CO5	Explore the connections between the notions of the derivative and the integral. Establish the necessary and sufficient condition for a function to be Riemann integrable and mention some of its applications	
CO6	Explain the concept of sequences of functions and their convergences. Detailed study on uniform convergence and apply this concept to define and derive the properties of exponential and logarithmic functions	

MM6CRT02	Graph Theory and Metric Space	Credits:4
CO1	Define Graph, types of graphs, subgraphs, vertex degree, paths and cycles	
CO2	Construct adjacency matrix and incidence matrix of each graphs	
CO3	Explain the concepts of trees and its properties	
CO4	Analyse the concepts of bridge, spanning tree, cut vertex and connectivity	
CO5	Explain Euler's tours, Hamiltonian cycle and apply these concepts in Chinese postman problem and travelling salesman problem.	
CO6	Define metric space, open set, closed set, cantor set.	
CO7	Discuss the examples of metric space, open set and closed set.	
CO8	Explain the concepts of convergence, completeness and continuous mapping in metric spaces	

MM6CRT03	Complex Analysis	Credits: 4
CO1	Explain functions of complex variables	
CO2	Analyse different concepts of functions of a complex variable	
CO3	Evaluate integrals of a function of complex variable	
CO4	Discuss some important theorems in complex analysis	
CO5	Explain the convergence of sequence and series	
CO6	Evaluate problems using Taylor's theorem and Laurent's series	
CO7	Describe singular points and residues of a complex function	
CO8	Apply residue in evaluating integrals	

MM6CRT04	Linear Algebra	Credits: 4
CO1	Analyse the concept elementary matrices, the process of Gaussian elimination	
CO2	Understand and analyze the definitions of Linear combinations of rows (columns), linear independence of columns, and row equivalent matrices	
CO3	Define and compute Hermite or reduced row-echelon matrices, rank of a matrix, column rank, normal form	
CO4	Understand the definitions vector spaces, subspaces, linear combination of vectors, spanning set, linear independence and basis	
CO5	Understand the notions of Linear transformations, Kernel and range, Rank and Nullity, Linear isomorphism with examples and properties	
CO6	Develop the knowledge of Characteristic polynomial, Characteristic equation, Algebraic multiplicities, Eigen space, Geometric multiplicities, Eigenvector, diagonalisation and Tri-diagonal matrix	
CO7	Solve the problems involving Characteristic equation, Algebraic multiplicities, Eigen space, Geometric multiplicities, Eigenvectors and eigen spaces	
MM6CBT01	**Operations Research - Elective**	**Credits: 3**
CO1	Understand the origin, definition, backgrounds of linear programming	
CO2	Explain duality in programming.	
CO3	Solve problems on transportation and assignment	
CO4	Analyze the theory behind game theory	

Complementary

SEMESTER 1

MM1CMT01	**Partial Differentiation, Matrices, Trigonometry And Numerical Analysis**	**Credits: 3**
CO1	Derive the expansions of sinnθ, cosnθ , tannθ $\sin^n\theta \cos^n\theta$	
CO2	Discuss circular and hyperbolic functions and summation of infinite series based on C+iS method.	
CO3	Explain rank of a matrix, transformations of a matrix, system of linear and non-linear homogeneous equations, Cayley Hamilton theorem.	
CO4	Determine the rank of a given matrix by reducing it to normal form.	
CO5	Determine the characteristic roots and characteristic vectors of a square matrix.	
CO6	Write the given system of linear equations in matrix form.	
CO7	Solve the system of linear equations using elementary transformations.	
CO8	Determine an approximate root of an equation using different methods.	

SEMESTER 2

MM2CMT01	**Integral Calculu and Differential Equations**	**Credits: 3**
CO1	Determine volumes using cross-section method and cylindrical shell method.	
CO2	Find the arc lengths and areas of surface of revolution.	
CO3	Explain double and triple integrals over rectangles, double integrals over general regions.	
CO4	Determine the area of a region using double integration and volume of a surface using triple integrals in rectangular coordinates.	
CO5	Discuss separable variables, exact differential equation, homogeneous equations and Bernoulli's equations.	
CO6	Solve the equations using substitution method.	
CO7	Explain surfaces & curves in three dimensions, linear equations of first order.	
CO8	Determine the solution of equations of the form dx/p = dy/q = dz/r	

SEMESTER 3

MM3CMT01	Vector Calculus, Analytic Geometry and Abstract Algebra	Credits: 4
CO1	Describe curves in space and their tangents, curvature and normal vector of a curve, directional derivatives and gradient vectors.	
CO2	Describe line integrals, vector fields and line integrals, path independence.	
CO3	Discuss Green's theorem in the plane, Stokes' theorem, Divergence theorem.	
CO4	Determine the arc length and curvature of a curve.	
CO5	Illustrate examples to verify Green's theorem, Stokes' theorem and Divergence theorem.	
CO6	Describe polar coordinates, conic sections and conics in polar coordinates.	
CO7	Explain groups, subgroups, cyclic groups, permutation groups and group homomorphism	
CO8	Determine whether a given set with an operation is a group.	

SEMESTER 4

MM4CMT01	Fourier Series, Laplace Transform And Complex Analysis	Credits: 4
CO1	Analyse the concepts of periodic functions, trigonometric series, Fourier series, odd and even functions.	
CO2	Explain the concepts of Laplace transform, linearity, shifting, differentiation and integration of transforms.	
CO3	Explain Cauchy Riemann equation, Laplace equation, Exponential function, Trigonometric function, Hyperbolic function	
CO4	Describe line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, and derivatives of analytic functions.	
CO5	Discuss examples to thorough the concepts of analytic function	
CO6	Determine the powers and roots of complex number.	
CO7	Determine the polar coordinates of complex number.	
CO8	Determine whether a function is analytic or not.	