Bachelor of Science
Subject: Mathematics

Program Specific Outcomes

After completing B.Sc. (Mathematics) Programme students will-

1. Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate course
2. Capable of expressing thoughts and ideas effectively in writing and orally; communicate confidently with others using appropriate media. Able to share one's views and express herself/ himself
3. Able to think in a critical manner. Critically evaluate practices, policies and theories by following scientific approach to knowledge development
4. Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group and act together as a group or a team in the interests of a common cause
5. Demonstrate empathetic social concern and equity centre national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering
6. Able to understand the issues of environmental contexts and sustainable development
7. Acquire the ability to engage in independent and life- long learning in the broadest context socio- technological changes.
8. Develop scientific temper in students

I Year / Certificate Course

COURSE TITLE	COURSE LEARNING OUTCOMES
ALGEBRA, VECTOR ANALYSIS AND GEOMETRY **S1-MATH-1T** ***Major-I***	***After the completion of the course, students will be able to-*** 1. Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix. using the rank of matrix 2. Find the eigen values and corresponding eigen vectors for a square matrix 3. Use the knowledge of vector calculus in geometry 4. Enhance the knowledge of three-dimensional geometrical figures (eg. cone and cylinder)
CALCULUS AND DIFFERENTIAL EQUATIONS **S1-MATH-2T** ***Major-II / Minor / Open Elective***	***After the completion of the course, students will be able to-*** 1. Sketch curves in a plane using its mathematical properties in the different coordinate systems 2. Use the derivatives in optimization, social sciences, physics and life sciences etc. 3. Formulate the differential equations for various mathematical models 4. Use techniques to solve and analyse various mathematical models

II Year / Diploma Course

COURSE TITLE	COURSE LEARNING OUTCOMES
ABSTRACT ALGEBRA AND LINEAR ALGEBRA **S2-MATH-1T** ***Major-I***	***After the completion of the course, students will be able to-*** 1. Recognize the algebraic structures as a group, classify them as abelian, cyclic and permutation groups, etc. 2. Link the fundamental concepts of groups and symmetrical figures 3. Analyse the subgroups of cyclic groups 4. Explain the significance of the notion of cosets, normal subgroups, and quotient groups 5. Learn the fundamental concept of rings, fields, subrings, integral domains and the corresponding morphisms 6. Analyse whether a finite set of vectors in a vector space is linearly independent. Explain the concepts of basis and dimension of a vector space 7. Understand the linear transformations, rank nullity, matrix of a linear transformation, algebra of transformation and change of basis 8. Compute the linear characteristics polynomial, eigenvalues, eigenvectors, and eigenspaces, as well as the geometric and the algebraic multiplicities of an eigenvalue and apply the basic diagonalization result
ADVANCED CALCULUS AND PARTIAL DIFFERENTIAL EQUATIONS **S2-MATH-2T** ***Major-II / Minor / Open Elective***	***After the completion of the course, students will be able to-*** 1. Learn many properties of the real line '$\mathbb{R}$' and sequences 2. Calculate the limit superior, the limit inferior, and the limit of a bounded sequence 3. Apply the concept of mean value theorem and Taylor's theorem in expansion of many functions 4. Apply the various tests to determine convergence and absolute convergence of an infinite series of real numbers 5. Formulate, Classify and transform partial differential equations into canonical form

III Year

COURSE TITLE	COURSE LEARNING OUTCOMES
LINEAR ALGEBRA AND NUMERICAL ANALYSIS **BSC1Y337**	***After the completion of the course, students will be able to-*** 1. Understand the concepts of vector spaces, subspaces, bases, dimension and their properties 2. Learn the concept of linear transformations, give the matrix representation of linear transformations and compute eigen values and eigen vectors of linear transformations. 3. Understand the concept of inner product spaces, its properties, and determine orthogonality in inner product spaces 4. Use of diagonalisation of linear transformations in various problems 5. Solve algebraic and transcendental equations by the various methods 6. Understand the concept of interpolations 7. Solve the linear equations by direct methods and also give the numerical solution of ODE by various methods
REAL AND COMPLEX ANALYSIS **BSC1Y338**	***After the completion of the course, students will be able to-*** 1. Learn the concept of Riemann integration and understand the equality of the second order partial derivative by the Schwarz's and Young's theorem 2. Check the convergency of Improper integrals using various test and use the Fourier series to signal and image processing etc. 3. Understand the concept of metric space, continuity of function in metric space, compact and connected metric space 4. Check the continuity, differentiability and analyticity of complex valued function and evaluate integral using Cauchy's theorem, Cauchy's Integral formula 5. Find the singularities, Taylor's, and Laurent's series of an analytical functions and contours Integration using Cauchy's Residue Theorem

COURSE TITLE	COURSE LEARNING OUTCOMES
STATISTICAL METHOD (OPTIONAL) **BSC1Y339**	***After the completion of the course, students will be able to-*** 1. Understand the uses of Measures of central tendency, Measures of dispersion, Skewness and Kurtosis 2. Find the Probability and conditional probability for an event by Baye's theorem and calculate the P.D.F., M.G.F. 3. Calculate theoretical distribution, their properties and its application 4. Fit a straight line and able to calculate the correlation coefficient and regression for the given data 5. Understand the concept of testing of hypothesis
DISCRETE MATHEMATICS (OPTIONAL) **BSC1Y339**	***After the completion of the course, students will be able to-*** 1. Learn the relation and its application in a computer 2. Understand about partial ordered set, lattice and their applications in computer 3. Apply the concept of graph theory to solve real world application like routing, TSP/Traffic Control etc. 4. Achieve minimum spanning tree by Kruskal's & Prim's Algorithms 5. Understand the planar graph, matrix representation of graphs

Master of Science in Mathematics

Program Specific Outcomes

After completion of M.Sc. (Mathematics) Programme students will be able to-

A. Knowledge outcomes

1. Understand the vast power of mathematical ideas and tools, as well as sophisticated knowledge of mathematical principles and methods
2. Able to utilise their abilities and knowledge, such as converting verbal information into mathematical form
3. Select and use appropriate mathematical equations or approaches to analyse the data and derive acceptable conclusions
4. Discover and interpret scientific reasoning for a variety of purposes
5. Understand about both pure and applied mathematics

B. Skill outcomes

1. Expose to a variety of global and local challenges that cover a wide range of mathematical sciences
2. Acquire a related understanding of mathematical concepts and their related structures
3. Explain scientific data in a clear manner both orally and in writing

C. Generic outcomes

1. Develop a favourable outlook on mathematics as a fascinating and worthwhile subject of study
2. Develop critical thinking and theoretical application
3. Solve a problem

I Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
ADVANCED ABSTRACT ALGEBRA-I **MSC008**	***After the completion of the course, students will be able to-*** 1. Understand the concept of Sylow's theorems and Jordan Holder theorem 2. Understand the proof of fundamental structure theorem for finitely generated modules 3. Achieve the knowledge of field theory and extension field 4. Understand the basic concept of Galois theory 5. Gain the knowledge of canonical forms, Jordon normal forms and linear transformation
ANALYSIS **MSC009**	***After the completion of the course, students will be able to-*** 1. Learn the basics of metric spaces 2. Understand the concept of continuity, compactness and connectedness 3. Understand the concept of sequence and series of function point wise and uniform convergence 4. Gain the knowledge of measurable sets and their properties 5. Learn the proofs of monotonic convergence theorem, Lebesgue convergence theorem and Fatou's lemma
INTEGRAL TRANSFORMS **MSC010**	***After the completion of the course, students will be able to-*** 1. Understand the concept of Laplace transformation and its properties 2. Evaluate the solution of differential equation using Laplace transformation 3. Apply the Laplace transformation in solution of initial and boundary value problems 4. Understand the concept of Fourier transformation and its properties 5. Apply the Fourier transformation in solution of initial and boundary value problems

COURSE TITLE	COURSE LEARNING OUTCOMES
COMPUTER FUNDAMENTAL AND PROGRAMMING IN C **MSC011**	***After the completion of the course, students will be able to-*** 1. Gain the knowledge of operating system, components of computer system 2. Know the basic knowledge of high level language, different types of data types used in C 3. Understand different types of operators and control flow statements in C 4. Understand the concept of array and storage classes in C 5. Run the programs of C and C++
PRACTICALS WITH PROGRAMMING IN C (PRACTICAL) **MSCM11(P)**	***After completion of Lab work, students will be able to create basic programs using C language.***

II Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
COMPLEX ANALYSIS **MSC2081**	***After the completion of the course, students will be able to-*** 1. Know the basic concepts of complex analysis 2. Evaluate limits and continuity of complex function & apply the concept of analyticity and the Cauchy-Riemann equations 3. Understand the concept of conformal mapping and its applications 4. Evaluate complex integrals and apply Cauchy's integral theorem and Cauchy's Residue theorem to solve complex integrals 5. Extend their knowledge to pursue research in the field of complex analysis
DIFFERENTIAL EQUATION **MSC2082**	***After the completion of the course, students will be able to-*** 1. Understand various types of ordinary differential equation, their solutions and the concepts about their existence and uniqueness 2. Understand the concept of maximal and minimal solution 3. Evaluate the eigenvalues and eigenvectors of ordinary differential equation 4. Understand the concept of stability 5. Solve problems of ordinary differential equations arising in various fields
TOPOLOGY **MSC2083**	***After the completion of the course, students will be able to-*** 1. Understand various basic topologies 2. Distinguish between finite, countable, and uncountable sets 3. Know about first and second countable spaces 4. Prove basic results about compactness, connectedness 5. Learn about separation axioms and familiar with the Urysohn lemma and the Tietze extension theorem, and able to characterize metrizable spaces

COURSE TITLE	COURSE LEARNING OUTCOMES
NUMERICALS METHODS **MSC2084**	***After the completion of the course, students will be able to-*** 1. Demonstrate understanding of common numerical methods 2. Apply numerical methods to obtain approximate solutions to algebraic and transcendental equations 3. Understand the concept of interpolation and extrapolation 4. Evaluate definite integrals using numerical methods 5. Evaluate the solution of ordinary differential equation
PRACTICALS WITH PROGRAMMING IN C++ (PRACTICAL) **MSC2086**	***After completion of Lab work, students will be able to create programs using C++ language.***

III Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
FUNCTIONAL ANALYSIS **MSCC050301**	***After the completion of the course, students will be able to-*** 1. Know about sets, spaces and continuous functions 2. Understand norm, normed linear spaces and basic properties of finite dimensional normed linear space 3. Acquire sufficient knowledge about uniform boundedness, open and closed graph theorems for real and complex linear spaces 4. Learn about structure and reflexivity of Hilbert spaces and to gain knowledge about orthonormal and complete orthonormal sets 5. Understand various operators and establish results like; Fundamental theorem on variational calculus and in bilinear forms
INTEGRAL EQUATIONS AND BOUNDARY VALUE PROBLEMS **MSCC050302**	***After the completion of the course, students will be able to-*** 1. Learn the concept of integral equations and their classification 2. Learn about solution of Fredholm integral equation with separable kernel and understand resolvent kernel 3. Understand the conversion of initial value problem to Volterra integral equation, boundary value problem to Fredholm integral equation and vice versa 4. Know about orthonormal system of function and understand Hilbert Schmidt theorem
OPERATION RESEARCH **MSCC050303**	***After the completion of the course, students will be able to-*** 1. Identify the scope of operation in different disciplines and also learn the formulation and finding of solution of LPP 2. Learn the formulation and techniques of optimal solution of transportation and assignment problem 3. Learn the method for determining the sequence of jobs, which minimizes the total elapsed time and also to optimize the outcome in production using replacement policy 4. Learn the construction of networks of a project and determine the critical path in project management 5. Understand the game theory and applications of queuing theory

COURSE TITLE	COURSE LEARNING OUTCOMES
MATHEMATICAL BIOLOGY **MSCC050304**	***After the completion of the course, students will be able to-*** 1. Understand modeling and perform stability analysis of continuous and discrete population models 2. Understand delay's model, competition model and their stability 3. Learn and analyse basic epidemiological models of infectious diseases 4. Analyse compartmental systems with continuous 5. Know about eigenvalues analysis for stability of the models 6. Understand the bath-tub model and continuous time infusion in compartments
PRACTICAL LAB PRACTICAL BASED ON OPTIONAL PAPERS (PRACTICAL) **MSCC050306**	***After the completion of the course, students will be able to-*** 1. Use MATLAB codes to simulate simple discrete and continuous time models 2. Create functions, martices and plot graphs using MATLAB

IV Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
PARTIAL DIFFERENTIAL EQUATION **MSCC050401**	***After the completion of the course, students will be able to-*** 1. Solve partial differential equation of first order 2. Classify and solve the partial differential equation of second order 3. Understand elliptic differential equations-Laplace and Poisson's equations with Dirichlet's and Neumann's problems in different geometrical conditions in Cartesian, cylindrical and spherical co-ordinate systems with various examples 4. Understand parabolic differential equations-heat equation and diffusion equation and corresponding boundary conditions 5. Understand hyperbolic differential equations- wave equations
ADVANCED GRAPH THEORY **MSCC050407**	***After the completion of the course, students will be able to-*** 1. Understand the various types of graph and its terminology 2. Understand the knowledge of trees and their properties 3. Learn about connectivity, separability and planarity in graphs 4. Understand the four colour conjecture 5. Learn about Kruskal, Prim's and Dijkastra's algorithm
DISCREATE MATHEMATICAL STRUCTURES **MSCC050411**	***After the completion of the course, students will be able to-*** 1. Know about sets and its applications, relation and Pigeon Hole principle 2. Learn about mathematical logical operators, tautologies and contradiction 3. Understand about the Lattice and its types 4. Gain the knowledge of Boolean algebra and its application in circuit 5. Solve the recurrence relation using generating function

COURSE TITLE	COURSE LEARNING OUTCOMES
SPECIAL FUNCTIONS **MSCC050412**	***After the completion of the course, students will be able to-*** 1. Gain the knowledge of beta and gamma functions 2. Understand hypergoemetric and generalized hypergeometric function 3. Know about Legendre's polynomial and its properties 4. Learn about Hermite and Laguerre polynomial and their recurrence relations and orthogonality 5. Understand the Mascrobert's E- function, Meijer's G- function and their properties
PRACTICAL BASED ON NUMERICAL METHODS (PRACTICAL) **MSCC050413**	***Students will be able to create programs of Numerical methods (Runge Kutta method, Predictor Corrector method, Euler's Modified method etc.) using MATLAB.***

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