1.1.1

M.Sc Mathematics

Programme Outcomes

On completion of the Programme the students will

PO1: have in-depth and advanced knowledge in both pure and applied Mathematics
PO2: have effective scientific and / or technical communication in both oral and writing
PO3: model and solve scientific and real life problems using the acquired mathematical knowledge
PO4: develop research acumen and pursue career in teaching, Research and development .
PO5: become self-motivated lifelong learners

Programme Specific Outcomes

On completion of the Programme the students will

PSO1: Think mathematically, analytically and critically
PSO2: Formulate proofs for theorems on their own.
PSO3: Approach problems in different perspectives and develop innovative method of solving.
PSO4: Use appropriate software tools to solve complicated mathematical problems.

Course Outcomes

Semester	Course Code	Course Name	Course Outcomes	
I	**21MM01**	**Core I Algebra**	CO 1	explain about another counting principle and three parts of Sylow's theorem
			CO 2	use the properties on Polynomial rings over the rational field and commutative rings
			ÇO 3	explain about extension fields and roots of polynomials
			CO 4	describe the elements of Galois theory
			CO 5	classify the properties of modules and finite fields
	21MM02	**Core II Real Analysis**	CO 1	represent derivatives in higher dimensional space and derive their properties

			CO 2	intrepret the properties of measurable sets and measurable functions
			ÇO 3	study lebesgue integral of bounded functions
			CO 4	relate integrable functions and absolutely continuous functions with differentiation of an integral and functions of bounded variation respectively.
			CO 5	derive the results connecting measure spaces, measurable functions and signed measure
	21MM03	**Core III Ordinary Differential Equations**	CO 1	solve the higher order linear differential equations
			CO 2	evaluate the second order linear equations and apply the Legendre and Bessel's equations to find the solutions in Power series.
			ÇO 3	solve the non-homogeneous linear equations with constant co-efficients and find the solutions
			CO 4	compute solution using Picard's theorem and find the existence and uniqueness of solutions of system.
			CO 5	solve boundary value problem and applications of boundary value problem
	21MM04	**Core IV Advanced Operations Research**	CO 1	determine the minimal spanning tree, shortest route and maximal flow in a network.
			CO 2	compute the optimum solution of a multivariable process by decomposing into a single variable sub-problems.
			ÇO 3	obtain the optimum inventory policies for probabilistic inventory models.
			CO 4	determine the measures of performance of various queuing systems.
			CO 5	obtain optimum solutions of non linear programming problems.
	21MME1	**Elective I Differential Geometry**	CO 1	determine osculating plane, torsion in space.
			CO 2	derive the natural equation of a curve and their properties.
			ÇO 3	determine fundamental forms and corresponding developable surfaces.
			CO 4	determine the Dupins indicatrix using the fundamental forms.
			CO 5	determine the fundamental equation of surfaces and their properties
	21MME2	**Elective I Number**	CO 1	define congruences and solve systems of linear congruences

		Theory	CO 2	identify primes and compute squares modulo p
			ÇO 3	classify numbers by Law of Quadratic Reciprocity and identify the primitive roots, quadratic residues, and quadratic non-residues.
			CO 4	evaluate Diaphontine Approximation and Pell's Equation
			CO 5	interpret the concepts of elliptic curves and Continued Fractions.
II	**21MM05**	**Core V Complex Analysis**	CO 1	explain the applications of analytic functions in the evaluation complex integrals and in Cauchy's theorem
			CO 2	represent meromorphic functions using partial fractions and factorization
			ÇO 3	describe equicontinuity and normality of families of analytic functions
			CO 4	explain the properties of harmonic and subharmonic functions
			CO 5	describe the properties of elliptic functions
	21MM06	**Core VI Partial Differential Equations**	CO 1	use partial derivative techniques to predict the behavior of vibrating string, membrane and heat conduction on solids and classify them.
			CO 2	solve IBVP such as Cauchy's problem, Goursat problem and wave equation by the method of characteristics.
			ÇO 3	solve IBVP using the method of separation of variables.
			CO 4	obtain the solution of the Boundary value problems using Fourier integrals.
			CO 5	obtain the solution of the Boundary value problems in terms of Greens function.
	21MM07	**Core VII Special Functions**	CO 1	obtain the general solution of Legendre's Equation, describe its properties, derive recurrence, Christoffel's and Rodrigue's formula and solve simple problems
			CO 2	derive the general solution of Hermite Polynomials, discuss its properties, and solve simple problems
			ÇO 3	solve Bessel's Equation, derive generating function, understand its properties obtain recurrence formula and solve simple problems
			CO 4	compute the general solution of Leguerre Polynomials, discuss its properties, and solve simple problems

			CO 5	find the solution of Chebyshev Polynomials, derive generating function, understand its properties and solve simple problems
	21MM08	**Core VIII Numerical Analysis**	CO 1	obtain the approximation of a given function using chebyshev polynomial and its rational form
			CO 2	solve ordinary differential equations
			ÇO 3	solve boundary value problems
			CO 4	solve partial differential equations such as heat equation, wave equation etc.,
			CO 5	use finite element methods to solve boundary value problems.
	21MME3	**Elective II Control Theory**	CO 1	determine the observability of linear and nonlinear systems.
			CO 2	determine the controllability of linear and nonlinear systems.
			ÇO 3	examine the stability of linear, Perturbed Linear and nonlinear systems.
			CO 4	stabilize a system via Linear Feedback and Restricted Feedback.
			CO 5	characterize and derive optimal control function.
	21MME4	**Elective II Stochastic Processes**	CO 1	explain the stochastic processes, Markov chain and stationary distributions.
			CO 2	describe the Poisson Process
			ÇO 3	calculate the time distribution of a Markov process.
			CO 4	classify the delayed and equilibrium Renewal Processes
			CO 5	determine the regenerative stochastic process
	21MMA1	**Advanced Learners Course I LaTeX**	CO	Use LaTeX to generate, prepare document report for given application
	21MMA2	**Advanced Learners Course I Financial Mathematics**	CO 1	define and describe Brownian motion
			CO 2	describe in detail the interest rates and compute the present value
			ÇO 3	design, build and evaluate pricing contracts using arbitrage and The Multi period Binomial Model
			CO 4	describe The Black – Scholes Option Cost and analyse the strategy of The Delta Hedging

				Arbitrage
			CO 5	illustrate the concept of various types of options and estimating the volatility parameter
III	**21MM09**	**Core IX Topology**	CO 1	illustrate the concept of topological spaces and continuous functions
			CO 2	determine the connectedness property of topological spaces
			ÇO 3	check the compactness and find the limit points of topological spaces
			CO 4	prove theorems based on compactness and completely regular
			CO 5	explain the concepts and theorems based on paracompactness
	21MM10	**Core X Classical Mechanics**	CO 1	derive the results of energy and momentum
			CO 2	solve simple physical problems using Lagranges equation and Routhian procedure.
			ÇO 3	use Euler-Lagrange equation, Hamilton's equation and principle of least action in solving physical problems.
			CO 4	determine the separability of a system.
			CO 5	differentiate different forms of transformations and obtain their principal forms.
	21MM11	**Core XI Programming with C++**	CO 1	know about various data types, operators and expressions
			CO 2	do with functions , classes and objects
			ÇO 3	use constructors, destructors and operator overloading
			CO 4	recognize inheritance and pointers
			CO 5	work with files.
	21MM12	**Core XII Mathematical Modelling**	CO 1	represent linear and nonlinear growth and decay models, compartment models and dynamic models through ordinary differential equations
			CO 2	derive population dynamics models, epidemic models, compartment models and economic models through system of ordinary differential equations of first order and solve them.
			ÇO 3	represent and derive the mathematical model of planetary motions, circular motions and Motion of satellites using ordinary differential equation of second order.
			CO 4	determine the mathematical model through

				difference equations and solve them.
			CO 5	derive the appropriate mathematical model using graphs.
	21MME5	**Elective III Graph Theory**	CO 1	recall and derive basic concepts of graph theory and tree related concepts
			CO 2	define different connectivity's of a graph, Eulerian and Hamiltonian graphs and characterize them
			ÇO 3	define the concepts matching and edge colouring in graphs and derive related properties
			CO 4	identify independent sets, Ramsay graphs, critical graphs and determine vertex colouring, chromatic number, chromatic polynomial of graphs.
			CO 5	identify planar graphs and derive their properties
	21MME6	**Elective III Coding Theory**	CO 1	understand the situations under which probability of incorrect decoding is zero
			CO 2	determine the minimum distance of a linear code
			ÇO 3	construct Cyclic codes
			CO 4	distinguish between perfect, Nearly perfect and uniformly packed binary codes.
			CO 5	able to generalize BCH codes
	21MMIS	**Internship/ Summer School/ Sports Training / Short Term Course**	CO 1	use profession specific terminology.
			CO 2	effectively plan and utilize ICT tools to complete the task.
			ÇO 3	apply the knowledge acquired in the campus to the given task.
			CO 4	demonstrate problem-solving and critical thinking skills.
			CO 5	exhibit appropriate workplace attitudes
IV	**21MM13**	**Core XIII Mathematical Methods**	CO 1	illustrate different types of integral equations, its Kernals and solve Fredholm integral equations
			CO 2	solve Abel integral equations and find the solutions Volterra integral equations
			ÇO 3	find Fourier transform of simple and rational functions
			CO 4	calculate Hankel Transforms of derivatives of functions and elementary functions
			CO 5	solve variational problem by constructing an appropriate functional, and solving the Euler-

				Lagrange equations.
	21MM14	**Core XIV Functional Analysis**	CO 1	check for the algebraic and topological aspects of a Banach space
			CO 2	describe the behaviour of projection on a Banach space
			ÇO 3	construct orthonormal sets from a orthogonal set and obtain the Fourier expansion of a vector
			CO 4	obtain the matrix representation of an operator given a basis
			CO 5	find the spectral radius of an element in a Banach Algebra
	21MM15	**Core XV Fluid Dynamics**	CO 1	derive the equations of motion
			CO 2	know the concepts of vorticity
			ÇO 3	determine the flow of an incompressible fluid in two dimensions
			CO 4	determine the flow of a viscous fluid under different conditions
			CO 5	derive boundary layer equations in incompressible flow
	21MME7	**Elective IV Statistical Methods**	CO 1	apply appropriate tests to test the significance of large samples by stating null and alternative hypothesis
			CO 2	test the significance of single proportion and difference of proportions
			ÇO 3	test the significance of mean, variance and standard deviation
			CO 4	apply Chi-square and Bartlett's test of homogeneity
			CO 5	apply t-test, paired t-test and F-test appropriately
	21MME8	**Elective IV Transforms and Signals**	CO 1	represent signals using Fourier Series and its properties
			CO 2	find different spectras of signals using Fourier Transforms and its properties
			ÇO 3	compute transform function and system impulse response for the LTI system
			CO 4	determine the Fourier representation of periodic sequences
			CO 5	obtain ROC of discrete-time exponential sequences using z-transform
	21MMPV	**Project and Viva-Voce**	CO 1	enhance their knowledge in the latest advancements in their area of interest.
			CO 2	understand the methodology of writing research articles

			ÇO 3	pool their expertise, knowledge and skills and complete the tasks.
			CO 4	effectively manage time, execute the plan and integrate various activities
			CO 5	break down a complex problem into simple components and determine solutions for the same.
	21MMA3	**Advanced Learners Course II Computational Mathematics Laboratory**	CO 1	explain the basic syntax in MATLAB
			CO 2	use basic structures to develop code in MATLA to handle arrays and perform mathematical operations
			ÇO 3	Perform vector operations and find the value of multiple integrals
			CO 4	apply the working knowledge of MATLAB to solve ODE's and LPP's.
			CO 5	interpret and visualize the solution of mathematical problems
	21MMA4	**Advanced Learner's Course II Mathematical Biology**	CO 1	determine the rate of growth or decay of insect population, fisheries
			CO 2	model prey – predator equations and ecosystems
			ÇO 3	find the prevalence of an infection, number of individuals affected and the effect of population age structure
			CO 4	study the effectiveness sexual reproduction and genetic dominance using difference equations under various situations
			CO 5	model random motion from polynomial sciences that are adopted in biological situations