Bachelor of Science
Department of Mathematics
PROGRAM OUTCOMES (2023-24)

POs	DESCRIPTIONS
PO1:	**Disciplinary Knowledge:** Bachelor degree in Mathematics is the culmination of in-depth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of pure and applied mathematics. This also leads to study the related areas such as computer science and other allied subjects.
PO2:	**Communication Skills:** Ability to communicate various mathematical concepts effectively using examples and their geometrical visualization. The skills and knowledge gained in this program will lead to the proficiency in analytical reasoning which can be used for modelling and solving of real-life problems.
PO3:	**Critical thinking and analytical reasoning:** The students undergoing this programme acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real life problems.
PO4:	**Problem Solving:** The Mathematical knowledge gained by the students through this programme develop an ability to analyze the problems, identify and define appropriate computing requirements for its solutions. This programme enhances students overall development and also equip them with mathematical modelling ability, problem solving skills.
PO5:	**Research related skills:** The completing this programme develop the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics.
PO6:	**Information/digital Literacy:** The completion of this programme will enable the learner to use appropriate software's to solve system of algebraic equation and differential equations.
PO7:	**Self-directed learning:** The student completing this program will develop ability of working independently and to make an in-depth study of various notions of Mathematics.
PO8:	**Moral and ethical awareness/reasoning:** The student completing this program will develop an ability to identify unethical behaviour such as fabrication, falsification or misinterpretation of data and adopting

			objectives, unbiased and truthful actions in all aspects of life in general and Mathematical studies in particular.
PO9:			**Lifelong learning:** This programme provides self-directed learning and lifelong learning skills. This programme helps the learner to think independently and develop algorithms and computational skills for solving real word problems.
PO10:			Ability to peruse advanced studies and research in pure and applied Mathematical sciences.

Course outcomes

CLASS	PAPER	COURSE OUTCOMES	DESCRESCRIPTIONS
B. SC. I SEM	Algebra - I and Calculus – I		This course will enable the students to
		CO1	**Learn** to **solve** system of linear equations.
		CO2	**Solve** the system of homogeneous and non-homogeneous linear of m equations in n variables by using concept of rank of matrix, **finding** eigen values and eigen vectors.
		CO3	**Sketch** curves in Cartesian, polar and pedal equations.
		CO4	Students will be familiar with the techniques of integration and differentiation of function with real variables.
		CO5	**Identify** and **apply** the intermediate value theorems and L' Hospital rule.
	Theory based Practical's on Algebra - I and Calculus – I	**CO1**	Learn Free and Open Source Software (FOSS) tools for computer programming.
		CO2	**Solve** problem on algebra and calculus theory studied in MATDSCT 1.1 by using FOSS software.
		CO3	Acquire knowledge of applications of algebra and calculus through FOSS Practical/Lab Work to be performed in Computer Lab (FOSS).
	Mathematics I	**CO1**	Learn to **solve** system of linear equations.
		CO2	**Solve** the system of homogeneous and non-homogeneous m linear equations by using the

				concept of rank of matrix, finding Eigen values and Eigen vectors.
			CO3	Students will be familiar with the techniques of differentiation of function with real variables.
			CO4	**Identify** and **apply** the intermediate value theorems and L' Hospital rule.
			CO5	**Learn** to trace some standard curves.
B. SC. II SEM		Algebra - II and Calculus – II	CO1	**Recognize** the mathematical objects called Groups.
			CO2	Link the fundamental concepts of groups and symmetries of geometrical objects.
			CO3	**Explain** the significance of the notions of Cosets, normal subgroups and factor groups.
			CO4	**Understand** the concept of differentiation and fundamental theorems in differentiation and various rules.
			CO5	**Find** the extreme values of functions of two variables.
		Theory based Practical's on Algebra - II and Calculus – II	CO1	**Learn** Free and Open Source Software (FOSS) tools for computer programming.
			CO2	**Solve** problem on algebra and calculus by using FOSS software's.
			CO3	Acquire knowledge of applications of algebra and calculus through FOSS Practical/Lab Work to be performed in Computer Lab.
		Mathematics - II	CO1	Recognize the mathematical objects called Groups.
			CO2	Link the fundamental concepts of groups and symmetries of geometrical objects.
			CO3	**Explain** the significance of the notions of Cosets, normal subgroups and factor groups.
			CO4	Understand the concept of differentiation and fundamental theorems in differentiation and various rules.
			CO5	**Find** the extreme values of functions of two variables.
			CO6	To understand the concepts of multiple integrals and their applications.

B. SC. III SEM	Ordinary Differential Equations and Real Analysis – I	CO1	**Solve** first-order non-linear differential equations and linear differential equations.
		CO2	To model problems in nature using Ordinary Differential Equations.
		CO3	Formulate differential equations for various mathematical models
		CO4	**Apply** these techniques to solve and analyze various mathematical models.
		CO5	Understand the fundamental properties of the real numbers that lead to define sequence and series, the formal development of real analysis.
		CO6	**Learn** the concept of Convergence and Divergence of a sequence.
		CO7	Able to handle and **understand** limits and their use in sequences, series, differentiation, and integration.
		CO8	**Apply** the ratio, root, alternating series, and limit comparison tests for convergence and absolute convergence of an infinite series.
	Theory based Practical's on Ordinary Differential Equations and Real Analysis – I	CO1	Free and Open Source software (FOSS) tools or computer programming.
		CO2	**Solving** exact differential equations.
		CO3	**Plotting** orthogonal trajectories.
		CO4	**Finding** complementary function and particular integral of linear and homogeneous differential equations.
		CO5	Acquire knowledge of applications of real analysis and differential equations.
		CO6	**Verification** of convergence/divergence of different types of series.
	Ordinary Differential Equations	CO1	**Understand** the concept of the differential equation and their classification
		CO2	Know the meaning of the solution of a differential equation.
		CO3	To **solve** first-order ordinary differential equations.
		CO4	To **Solve** exact differential equations and Converts to separable and homogenous equations to exact differential equations by

			integrating factors.
		CO5	To **Solve** Bernoulli differential equations.
		CO6	To **find** the solution to higher-order linear differential equations.
B. SC. IV SEM	Partial Differential Equations and Integral Transforms	CO1	**Solve** the Partial Differential Equations of the first order and second order.
		CO2	Formulate, classify and transform partial differential equations into canonical form.
		CO3	**Solve** linear and non-linear partial differential equations using various methods; and apply these methods to solving some physical problems.
		CO4	Able to take more courses on wave equation, heat equation, and Laplace equation.
		CO5	**Solve** PDE by Laplace Transforms and Fourier Transforms.
	Theory based Practical's on Partial Differential Equations and Integral Transforms	CO1	**Learn** Free and Open Source software (FOSS) tools or computer programming.
		CO2	**Solve** problems on Partial Differential Equations and Integral Forms.
		CO3	To **find** Laplace transform of various functions.
		CO4	To **find** the Fourier Transform of periodic functions.
		CO5	To **solve** differential equations by using Integral transforms.
B. SC. V SEM	Real Analysis-II and Complex Analysis	CO1	Carry out certain computations such as **computing** upper and lower Riemann sums as well integrals.
		CO2	**Describe** various criteria for Integrability of functions.
		CO3	Exhibit certain properties of mathematical objects such as integrable functions, analytic functions, harmonic functions and soon.
		CO4	**Prove** some statement srelated to Riemann integration as well as in complex analysis.
		CO5	Carry out the existing algorithms to construct mathematical structures such as analytic functions.

		CO6	**Applies** the gained knowledge to solve various other problems.
	Practical's on Real Analysis-II and Complex Analysis	CO1	**Learn** Free and Open-Source Software (FOSS) tools for computer programming.
		CO2	**Solve** problem on Real Analysis and Complex Analysis studied in Real Analysis-II and Complex Analysis paper by using FOSS software's.
		CO3	**Acquire** knowledge of applications of Real Analysis and Complex Analysis through FOSS.
	Vector Calculus and Analytical Geometry	CO1	Get introduced to the fundamentals of vector differential and integral calculus.
		CO2	Get familiar with the various differential operators and their properties.
		CO3	Get acquainted with the various techniques of vector integration.
		CO4	**Learn** the applications of vector calculus.
		CO5	Recollect the fundamentals of Analytical Geometry in 3D.
		CO6	Interpret the geometrical aspects of planes and lines in3D.
	Practical's on Analytical Geometry and Vector Calculus	CO1	Learn Free and Open-Source Software (FOSS) tools for computer programming.
		CO2	**Solve** problem on Analytical Geometry and Vector Calculus studied in Vector Calculus and Analytical Geometry paper by using FOSS software's.
B. SC. VI SEM	Linear Algebra	CO1	**Understand** the concepts of Vector spaces, subspaces, bases dimension and their properties.
		CO2	Become familiar with the concepts of Eigen values and Eigen vectors, linear transformations etc.
		CO3	**Prove** various statements in the context of vectors spaces.
	Practical's on Linear Algebra	CO1	**Learn** Free and Open-Source Software (FOSS) tools for computer programming.
		CO2	**Solve** problem on Linear Algebra studied in

			Linear Algebra paper by using FOSS software.
		CO3	Acquire knowledge of applications of Linear Algebra through FOSS.
	Numerical Analysis	CO1	Describe various operators arising in numerical analysis such as difference operators, shift operators and so on.
		CO2	Articulate the rationale behind various techniques of numerical analysis such as in finding roots, integrals and derivatives.
		CO3	Reproduce the existing algorithms for various tasks as mentioned previously in numerical analysis.
		CO4	Apply the rules of calculus and other areas of mathematics in justifying the techniques of numerical analysis.
		CO5	Solve problems using suitable numerical technique.
		CO6	Appreciate the profound applicability of techniques of numerical analysis in solving real life problems and also appreciate the way the techniques are modified to improve the accuracy.
	Practical's on Numerical Analysis	CO1	Learn Free and Open-Source Software (FOSS) tools for computer programming.
		CO2	Solve problem on numerical Analysis studied in Numerical Analysis paper by using FOSS software's.
		CO3	Acquire knowledge of applications of numerical Analysis through FOSS.
	Project	CO1	Gain Experience in research.
		CO2	Understand research Methodology and it helps in research career.

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