Program Outcome, Program Specific Outcome and Course Outcome for B.Sc. Mathematics

The Bachelor's Degree in B.Sc. (Hons) Mathematics is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements sought to be acquired by learners at the end of this program. Hence, the learning outcomes of mathematics for this course are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for knowledge of mathematics. Mathematics is the study of quantity, structure, space and change. It has very broad scope in science, engineering and social sciences. The key areas of study in mathematics are Calculus, Algebra, Geometry, Analysis, Differential Equations and Mechanics. Programme Specific Outcome of B.Sc. Mathematics • Think in a critical manner. • Familiarize the students with suitable tools of mathematical analysis to handle issues and problems in mathematics and related sciences. • Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of mathematics and statistics. • Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in mathematics and its allied areas on multiple disciplines concerned with mathematics. • Encourage the students to develop a range of generic skills helpful in employment, internships and social activities. Bachelor's degree in mathematics is the culmination of in-depth knowledge of algebra, calculus, geometry, differential equations and several other branches of mathematics. This also leads to study of related areas like computer science, Financial Mathematics, statistics and many more. Thus, this programme helps learners in building a solid foundation for higher studies in mathematics. The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning. This can be utilised in modelling and solving real life problems. Students undergoing this programme learn to logically question assertions, to recognise patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society. Students completing this programme will be able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians. Completion of this programme will also enable the learners to join teaching profession in primary and secondary schools. This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

Course Learning Outcomes:

Semester I Ordinary Differential Equations This course will enable the students to: i) Understand the genesis of ordinary differential equations. ii) Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order. iii) Know Picard's method of obtaining successive approximations of solutions of first order differential equations, passing through a given point in the plane and Power series method for higher order linear equations, especially in cases when there is no method available to solve such equations. iv) Grasp the concept of a general solution of a linear differential equation of an arbitrary order and also learn a few methods to obtain the general solution of such equations. v) Formulate mathematical models in the form of ordinary differential equations to suggest possible solutions of the day to day problems arising in physical, chemical and biological disciplines.

Semester II three dimensional geometry This course will enable the students to: i) Apply a range of techniques to solve first & second order linear equations. ii) Model physical phenomena using vector equations such as the normal and tangent equations.

Semester III Calculus: This course will enable the students to: i) Assimilate the notions of limit of a sequence and convergence of a series of real numbers. ii) Calculate the limit and examine the continuity of a function at a point. iii) Understand the consequences of various mean value theorems for differentiable functions. iv) Sketch curves in Cartesian and polar coordinate systems. v) Apply derivative tests in optimization problems appearing in social sciences, physical sciences, life sciences and a host of other disciplines.

Semester IV Real Analysis This course will enable the students to: i) Understand many properties of the real line $\mathbb{R}$ and learn to define sequence in terms of functions from $\mathbb{R}$ to a subset of $\mathbb{R}$. ii) Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence. iii) Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers. iv) Learn some of the properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.

Semester V Group Theory The course will enable the students to: i) Recognize the mathematical objects called groups. ii) Link the fundamental concepts of groups and symmetries of geometrical objects. iii) Explain the significance of the notions of cosets, normal subgroups, and factor groups. iv) Analyze consequences of Lagrange's theorem. v) Learn about structure preserving maps between groups and their consequences.

Semester V Linear Algebra This course will enable the students to: i) Understand the concepts of vector spaces, subspaces, bases, dimension and their properties. ii) Relate matrices and linear transformations, compute eigen values and eigen vectors of linear transformations. iii) Learn properties of inner product spaces and determine orthogonality in inner product spaces. iv) Realise importance of adjoint of a linear transformation and its canonical form.

Semester VI Multivariable Calculus This course will enable the students to: i) learn conceptual variations while advancing from one variable to several variables in calculus. ii) Apply multivariable calculus in optimization problems. iii) Inter-relationship amongst the line integral, double and triple integral formulations. iv) Applications of multivariable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc. v) Realize importance of Green, Gauss and Stokes' theorems in other branches of mathematics.

Semester VI Ring Theory This course will enable the students to: i) understand the basic concepts of group actions and their applications. ii) Recognize and use the Sylow theorems to characterize certain finite groups. iii) Know the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains, and fields. iv) Learn in detail about polynomial rings, fundamental properties of finite field extensions, and classification of finite fields.

Semester VI Numerical Analysis This course will enable the students to: i) obtain numerical solutions of algebraic and transcendental equations. ii) Find numerical solutions of system of linear equations and check the accuracy of the solutions. iii) Learn about various interpolating and extrapolating methods. iv) Solve initial and boundary value problems in differential equations using numerical methods. v) Apply various numerical methods in real life problems.