

## Programme and course outcome

### Department of Mathematics

Programme: BA/B.Sc.

Programme outcome: The syllabus of Mathematics is designed to:

- Equip students with logical reasoning, mathematical thinking and problem solving skills.
- Enable students to apply the mathematical method and ideas not only to problem in Mathematics but also to other related fields such as Chemistry, Physics, Computer Science, Economics, Commerce, Statistics etc.
- Develop proficiency in writing proofs that empower students to communicate mathematical ideas both orally and in writing
- Prepare students for jobs in various sectors such as teaching, banking, research etc.
- Equip students for advanced study in the field of Mathematics, Statistics, Data Science etc.
- Prepare students for various competitive exam such as civil services, SSC, bank P.O., etc.

### Course outcome for B.Sc. and BA

Course	Outcome
<b>Algebra</b>	At the end of this course, the students will be able to : <ul style="list-style-type: none"><li>• Recognize technical terms &amp; appreciate some of the uses of algebra.</li><li>• Solve system of linear equation(both homogeneous and non homogeneous) using matrices.</li><li>• Solve polynomial equation having condition on roots.</li><li>• Solve cubic and biquadratic equations.</li></ul>
<b>Calculus</b>	At the end of this course the student will be familiar with: Limit, Continuity and the type of discontinuities and differentiability of functions. Asymptotes and curvature, Reduction formulae, Rectification, Quadrature (area) and the volume and surface of solids of revolution.
<b>Ordinary Differential Equations</b>	At the end of this course the student will be familiar with: <ul style="list-style-type: none"><li>• Basic properties of differential eqn, Orthogonal trajectories, Linear differential eqn, solution of ODE by different methods such as variation of parameters, method of undetermined coefficients etc.</li><li>• Solution of simultaneous and total diff. eqn.</li></ul>

<b>Vector Calculus and Geometry</b>	<p>At the end of this course the student will be familiar with:</p> <ul style="list-style-type: none"> <li>• Scalar and vector product of vectors, their directional derivatives, Gradient, Divergence and curl of vector point function</li> <li>• Laplacian operator, Orthogonal</li> <li>• Cylindrical and spherical co-ordinates, Vector integration</li> <li>• Tracing of Conics, Sphere, Cone and Cylinder</li> </ul>
<b>Numerical Analysis</b>	<p>At the end of this course ,students will be familiar with:</p> <ul style="list-style-type: none"> <li>• Elementary numerical methods for solving algebraic and transcendental equations, interpolation, function approximation, integration, solution of ODE, the solution of linear equation and matrix inversion and the calculation of eigen value and eigen vectors.</li> <li>• Understand the theory behind these methods.</li> <li>• Able to apply these methods to find numerical approximation and error estimates in a range of problem in the field of science and engineering.</li> </ul>
<b>Advanced Calculus</b>	<p>At the end of course, student will be familiar with:</p> <ul style="list-style-type: none"> <li>• Concepts of limit and definition of continuous function. They will differentiate the terms continuity and uniform continuity.</li> <li>• Define all kind of discontinuity-First, Second and mixed or removable discontinuity</li> <li>• They will be able to understand the concept of limit continuity of two variable, Partial differentiation, Differentiability of function of two variable, Maxima and Minima of Function, Jacobian, Beta and Gamma functions. They will be able to solve numerical of double and triple integral.</li> </ul>
<b>Partial Differential Equations and Special Functions</b>	<p>At the end of this course the student will be familiar with:</p> <ul style="list-style-type: none"> <li>• Partial Differential Eqn their formation</li> <li>• Linear PDE of second and higher order and methods to solve them</li> <li>• Classification of linear second order ,their characteristic eqn &amp; characteristic curves</li> <li>• Series solution of Differential eqn, Bessel and legendary function &amp; their properties</li> </ul>
<b>Mechanics</b>	<p>At the end of this course the student will be familiar with:</p> <ul style="list-style-type: none"> <li>• Forces in two and three dimensions, Wrenches, null lines &amp; null planes</li> <li>• The concept of velocity and acceleration along radial, transverse, tangential and normal directions ,relative velocity and accelatation, simple harmonic motion, Hooke's law, Newtons law of motion, central orbit, Kepler's laws of planetary motion and Newton's laws of gravitation.</li> </ul>

<b>Real Analysis</b>	<p>Upon completion of syllabus of paper Real Analysis , a student will be familiar with:</p> <ul style="list-style-type: none"> <li>• Riemann integral, The fundamental theorem of integral Calculus, Mean Value theorem of integral calculus</li> <li>• Improper integral and their convergence, comparison test, Abel's and Drichlet's tests, Frullani's integral</li> <li>• Definition and example of metric space, neighbourhood , open and close sets, closure , subspace of a metric space, Cauchy sequence, completeness.</li> <li>• Continuous functions, uniform continuity, Compactness for metric space, Bolzano-Weierstrass property, finite intersection property.</li> </ul>
<b>Groups and Rings</b>	<p>At the end of this course, the students will :</p> <ul style="list-style-type: none"> <li>• have a working knowledge of fundamental concept in abstract algebra such as groups normal group, subgroups, ring, field, homomorphisms and isomorphisms on groups &amp; rings and their properties.</li> <li>• Understand and prove fundamental results and solve algebraic problems using appropriate techniques.</li> </ul>
<b>Numerical Analysis</b>	<p>At the end of this course, the students will :</p> <ul style="list-style-type: none"> <li>• Be familiar with Interpolation, function approximation, integration, solution of ODE, the solution of linear equation and matrix inversion and the calculation of eigen value and eigen vectors.</li> <li>• Understand the theory behind these methods.</li> <li>• Be able to apply these methods to find numerical approximation and error estimates in a range of problem in the field of science and engineering.</li> </ul>
<b>Real and Complex Analysis</b>	<p>At the end of this course, the students will be familiar with :</p> <ul style="list-style-type: none"> <li>• Jacobians, Beta &amp; Gamma functions, Double &amp; Triple Integrals, Dirichlets integrals,</li> <li>• Fourier series &amp; expansion, Half range series</li> <li>• Extended Complex plane, Analytic function Cauchy-Riemann and Harmonic eqn</li> <li>• Mappings by elementary functions, Mobius transformation.</li> </ul>

<b>Linear Algebra</b>	<p>At the end of this course, the students will be :</p> <ul style="list-style-type: none"> <li>• Able to analyze vector in <math>\mathbb{R}^n</math> geometrically and algebraically finite and infinite dimensional vector spaces and subspaces over a field and their properties including the basic structure of vector spaces.</li> <li>• Familiar with concept of the linear transformation and use matrix algebra to linear transformation.</li> <li>• Able to compute inner products and determine the orthogonality on vector spaces including gram Schmidt orthogonalization and identity and self adjoint transformation.</li> <li>• Able for solving a range of problem in the fields of engineering and sciences.</li> </ul>
<b>Dynamics</b>	<p>At the end of this course, the students will be familiar with:</p> <ul style="list-style-type: none"> <li>• The concept of velocity and acceleration along radial, transverse, tangential and normal directions ,relative velocity and acceleration, simple harmonic motion, Hooke's law, Newtons law of motion, conservative and impulsive forces motion of a body on smooth and rough plane curves, projectile motion of a particle in a plane, central orbit, Kepler's law of planetary motion .</li> </ul>
<b>Mathematics Lab-I,II,III,IV</b>	<p>At the end of this course, the students will be able to :</p> <ul style="list-style-type: none"> <li>• Write a program in C language in general as well as in the context of mathematical problems.</li> </ul>