Department of Mathematics

Mathematics Course Learning Outcomes in B.Sc (PCM)

Class and Paper	B.Sc 01st Year and Paper I
Title of the Paper	Algebra and Trigonometry
Course Code/ Paper code	
Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to

- Understand the importance of roots of real and complex polynomials and learn various methods of obtaining roots.
- Familiarize with relations, equivalence relations and partitions.
- Employ De Moivre's theorem in a number of applications to solve numerical problems.
- Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.
- Find Eigen values and corresponding eigenvectors for a square matrix.
- Explain the properties of three dimensional shapes.

Class and Paper	B.Sc Ist Year and Paper II
Title of the Paper	Calculus
Course Code/ Paper code	
Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to

- Assimilate the notions of limit of a sequence and convergence of a series of real numbers.
- Calculate the limit and examine the continuity of a function at a point.
- Understand the consequences of various mean value theorems for differentiable functions.

- Sketch curves in Cartesian and polar coordinate systems.
- Apply derivative tests in optimization problems appearing in social sciences, physical sciences, life sciences and a host of other disciplines.

Class and Paper	B.Sc Ist Year and Paper III
Title of the Paper	Vector Analysis and Geometry
Course Code/ Paper code	
Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to
- Learn about properties of linear transformation and isomorphism theorems.
- Understand the concept of polynomials and their prime factorization.
- Find canonical form of linear transformations.
- Obtain various variants of diagonalisation of linear transformations.
- Apply Cauchy-Schwarz inequality for deriving metric on inner product spaces and obtain orthonormal basis using Gram-Schmidt orthogonalisation.

Class and Paper	B.Sc IInd Year and Paper I
Title of the Paper	Advance Calculus
Course Code/ Paper code	
Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to
- Learn conceptual variations while advancing from one variable to several variables in calculus.
- Apply multivariable calculus in optimization problems.
- Inter-relationship amongst the line integral, double and triple integral formulations.
- Applications of multivariable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.
- Realize importance of Green, Gauss and Stokes' theorems in other branches of mathematics.

Class and Paper	B.Sc IInd Year and Paper II
Title of the Paper	Differential Equations
Course Code/ Paper code	

Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to

- Understand the genesis of ordinary as well as partial differential equations.
- Learn various techniques of getting exact solutions of certain solvable first order differential equations and linear differential equations of second order.
- Know Picard's method of obtaining successive approximations of solutions of first order ordinary differential equations, passing through a given point in the plane.
- Learn about solution of first order linear partial differential equations using Lagrange's method.
- Know how to solve second order linear partial differential equations with constant coefficients.
- Formulate mathematical models in the form of ordinary and partial differential equations to problems arising in physical, chemical and biological disciplines.

Class and Paper	B.Sc IInd Year and Paper III
Title of the Paper	Mechanics
Course Code/ Paper code	
Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to

- Familiarize with subject matter, which has been the single centre, to which were drawn mathematicians, physicists, astronomers, and engineers together.
- Understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body.
- Determine the centre of gravity of some materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight.
- Deal with the kinematics and kinetics of the rectilinear and planar motions of a particle including the constrained oscillatory motions of particles.
- Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton.

Class and Paper	B.Sc IIIrd Year and Paper I
Title of the Paper	Analysis

Course Code/ Paper code	0898
Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to

- 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 $\mathbb{R}$.
- Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.
- Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.
- Learn some of the properties of Riemann integral functions, and the applications of the fundamental theorems of integration.
- Visualize complex numbers as points of $\mathbb{R}^2$ and stereographic projection of complex plane on the Riemann sphere.
- Understand the significance of differentiability and analyticity of complex functions leading to the Cauchy-Riemann equations.
- Learn the role of Cauchy-Goursat theorem and Cauchy integral formula in evaluation of contour integrals.
- Apply Liouville's theorem in fundamental theorem of algebra.
- Understand the convergence, term by term integration and differentiation of a power series.
- Learn Taylor and Laurent series expansions of analytic functions; classify the nature of singularity, poles and residues and application of Cauchy Residue theorem.
- Learn basic facts about the cardinality of a set.
- Understand several standard concepts of metric spaces and their properties like openness, closedness, completeness, Bolzano ~ Weierstrass property, compactness, and connectedness.
- Identify the continuity of a function defined on metric spaces and homeomorphisms.

Class and Paper	B.Sc IIIrd Year and Paper II
Title of the Paper	Abstract Algebra
Course Code/ Paper code	0899
Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to

- Employ De~ Moivre's theorem in a number of applications to solve numerical problems.

- Learn about the fundamental concepts of groups, subgroups, normal subgroups, isomorphism theorems, cyclic and permutation groups.
- Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.
- Find Eigen values and corresponding eigenvectors for a square matrix.
- Understand real vector spaces, subspaces, basis, dimension and their properties.

Class and Paper	B.Sc IIIrd Year and Paper III
Title of the Paper	Discrete Mathematics
Course Code/Paper code	0901
Credits	02
Total Hours	24

Course learning outcome:

After going through the course, the student should be able to

- Learn about partially ordered sets, lattices and their types.
- Understand Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.
- Solve real-life problems using finite-state and Turing machines.
- Assimilate various graph theoretic concepts and familiarize with their applications.

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