



***THE LEARNING OUTCOME  
FRAME OF UG AND PG COURSE  
OF MATHEMATICS***

### Program Outcomes:

### Faculty- Science

- ❖ *After graduation in science faculty a student should have: Acquired the knowledge with facts and figures related to various subjects in pure sciences such as Physics, Chemistry, Botany, Zoology, Mathematics, etc.*
- ❖ *Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevance in the day-to-day life.*
- ❖ *Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments The skills of observations and drawing logical inferences from the scientific experiments.*
- ❖ *Developed scientific outlook not only with respect to science subjects but also in all aspects related to life. Realized that knowledge of subjects in other faculties such as humanities, performing arts, social sciences etc. can influence in evolving new scientific theories and inventions.*
- ❖ *Imbined ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. Developed various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.*
- ❖ *Realized that pursuit of knowledge is a lifelong activity and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.*
- ❖ *Developed flair by participating in various social and cultural activities voluntarily, in order to spread knowledge, creating awareness about the social evils, blind faith etc.*

***After the successful completion of this course, the student will be able to;***

- ❖ explain the core ideas and the techniques of mathematics at the college level.*
- ❖ recognize the power of abstraction and generalization, and to carry out investigative mathematical work.*
- ❖ setup mathematical models of real world problems and obtain solutions in structured and analytical approaches.*
- ❖ conduct self-evaluation, and continuously enrich themselves through lifelong learning.*
- ❖ carry out objective analysis and prediction of quantitative information utilizing appropriate information and communication technology and arouse their interest in the beauty and precision of mathematical arguments and science.*
- ❖ work independently and to collaborate effectively in team work and team building.*
- ❖ recognize the importance of compliance with the ethics of science and being a responsible citizen towards their community and a sustainable environment.*
- ❖ cultivate a mathematical attitude and nurture the interests.*

# Course Outcome

## B. Sc. 1<sup>st</sup> Year :

Title of Paper	On Completion of this course, successful students will be able to :
❖ Algebra and Trigonometry	❖ familiarize real and imaginary parts of circular and hyperbolic function, Cayley-Hamilton theorem solve system of linear equation using matrix, find Eigen roots and values, understand relation between roots and coefficients of equation.
❖ Calculus and Differential Equations	❖ find the Cartesian and polar equation of line, circle, tangent, Normal at a point. Expand a function using Taylor's and Maclaurin's series, concept of asymptotes, curvature and curve tracing.
❖ Vector Analysis and Geometry	❖ Represent vector analytically and geometrically, and compute dot and cross product for presentation of line and planes, find derivative and integrals of vector function using the concept of Gauss, Green and Stokes's theorem, Solids of revolution, conic section and conicoid.

## B. Sc. 2<sup>nd</sup> Year :

Title of Paper	On Completion of this course, successful students will be able to :
❖ Abstract Algebra	❖ Assess properties implied by the definition of groups, Rings, Field and Integral Domain. Use various canonical types of groups and rings, analyze and demonstrate examples of Subgroup, Normal subgroup, Quotient group, Ideals, Quotient rings, Homomorphism groups and rings
❖ Advanced Calculus	❖ Analyze the fundamental theorem of calculus, evaluate line integral, Work with sequences and series, analyze continuity and differentiability, Jacobian's. Find maxima and minima of functions, Evaluate and envelopes, solve double and triple integrals, Beta and Gamma functions, determine volume of surfaces
❖ Differential Equations	❖ Obtained integrating factor, reduce DE into Exact DE, obtained solution of Clairaut's equation, find C. F. and P. I. of Linear DE, Method of solution of DE, Distinguish integrals of first order Linear PDE into complete general singular integrals, solution by Lagrange's method and Laplace transform techniques, Power series solution of DE.

## B. Sc. 3<sup>rd</sup> year:

Title of Paper	On Completion of this course, successful students will be able to :
❖ <i>Linear Algebra and Numerical Analysis</i>	<p>❖ <i>Understand the idea of vector space, analyze finite and infinite dimensional vector space and subspaces over a field and their properties. Use the properties of Linear Transformation and matrices, change of basis , compute with characteristic polynomial .</i></p> <p>❖ <i>Understand approximation and its errors and types, find solution of equation, interpolations by various method and their convergence.</i></p> <p>❖ <i>To compute solution of Linear Equation by Direct and Indirect Method such as Gauss Jordan, Jacobi , LU-decomposition method based on numerical differentiation.</i></p> <p>❖ <i>To find solution of ODE by Euler, Runge-kutta's, Milne method etc. based on Numerical Integration.</i></p>
❖ <i>Real Analysis,</i>	<p>❖ <i>to understand the partitions and their refinement, Riemann integrability and theorem on integrability, recall defining properties of a metric space and complete metric space, theorems on open set, closed set, Limit point, closure, cantor set,</i></p>
❖ <i>Discrete Mathematics (Optional)</i>	<p>❖ <i>Language of mathematics, quantifiers , truth table, tautology , Contradiction, knowledge of Boolean algebra, normal form, circuits etc..</i></p>
❖ <i>Statistics (Optional)</i>	<p>❖ <i>To understand the probabilities and their types , theorem based on probabilities central and raw moments , Moment generating function , central tendencies, Probability distribution, Poission distribution, Binomial distribution, kurtosis and skewness.</i></p>

## M. Sc. I<sup>st</sup> Semester:

Title of Paper	On Completion of this course, successful students will be able to :
❖ <i>Advanced Abstract Algebra</i>	❖ <i>Demonstrate knowledge of group homomorphism and isomorphism , conjugate, class equation, sylows theorem, solvable groups and associated properties and polynomials rings , characteristics of field and prime subfield, factorization, structure of primitive polynomials, extension fields, splitting fields , galois group and galois theory.</i>
❖ <i>Real Analysis</i>	❖ <i>Evaluate limits of wide class of real sequences and series, determination of convergence and divergence by various test, Riemann-Stieltjes integral and its Properties, Cauchy criterion for uniform convergence, Weierstrass approximation theorem, Power series, uniqueness theorem for power series Abel's and Tauber's theorems, chain rule, Derivatives of higher</i>
❖ <i>Complex Analysis –I</i>	❖ <i>Demonstrate knowledge of Complex integration , Cauchy's inequality, maximum modulus principle, Residues and singularities, Bilinear transformations.</i>
❖ <i>Functional Analysis</i>	❖ <i>Completeness and Baire's , cantor's Theorem, Minkowski and Holders inequalities, Banach space and examples, Hahn-Banach , open mapping, Closed graph theorem, Hilbert Space, spectral theory.</i>
❖ <i>Topology</i>	❖ <i>Topology, relative topology and their basis, The product topology, Continuity, Homeomorphisms, Metrizable, Connected space, Separation, compactness and related theorems</i>

# M.Sc. 2<sup>nd</sup> Semester:

Title of Paper	On Completion of this course, successful students will be able to :
❖ <i>Advanced Abstract Algebra-II</i>	❖ <i>Demonstrate knowledge of Galois theory, Group of automorphisms of a field, Modules, Fundamental Structure theorem of finitely generated modules over a Principal Ideal Domain and its applications</i>
❖ <i>Advanced Discrete Mathematics</i>	❖ <i>understand Algebraic Structures , Lattices , their tyoes and properties, Graph Theory, Path and Circuits, Trees and spanning trees.</i>
❖ <i>Complex Analysis - II</i>	❖ <i>Apply the concept of Weierstrass factorization theorem, Analytic Continuation, Harmonic function, Dirichlet's problem, Green's</i>
❖ <i>Lebesgue Measure &amp; Integration</i>	❖ <i>Understand the Measurable sets, Reimann and Lebesque Integrals, four derivatives, Lp-spaces and Completeness , Dual of space, convergence in Measure.</i>
❖ <i>Ordinary and Partial Differential Equations</i>	❖ <i>understand Exact differential equations and adjoints, Partial differential equations, Power series solutions and special functions, Laplace Transforms, Applications to differential equations, Derivatives and integrals of Laplace transforms, Convolutions and Abel's Mechanical problem.</i>

# M. Sc. 3rd Semester:

Title of Paper	On Completion of this course, successful students will be able to :
❖ <i>Linear Programming</i>	❖ <i>Demonstrate knowledge of Formulation and solution of the Linear Programming Problem, Assignment problem, Transportation problem, Sequencing problem and their solutions.</i>
❖ <i>Mathematical Statistics</i>	❖ <i>understand frequencies distribution, Probability, Mathematical expectation, test of significance , chai square, t, F, Z test.</i>
❖ <i>Advanced Special Function</i>	❖ <i>Apply the concept of Hyper geometric functions, Legendre function Legendre polynomial, bassels functions, Bessel polynomials</i>
❖ <i>Applied Functional Analysis</i>	❖ <i>Understand Hilbert spaces, Projection on a cone and a linear subspace, Weak convergence, Convex sets and convex programming, Functions transformations and operators and Spectral theory of operators.</i>
❖ <i>Integral Transform - I</i>	❖ <i>Application of Laplace Transforms in Differential Equations, Laplace's equations, Laplace's wave equations, Application of Laplace Transforms in Integral Equations.</i>



# M. Sc. 4<sup>th</sup> Semester:

Title of Paper	On Completion of this course, successful students will be able to :
❖ <i>Operations Research</i>	❖ <i>Demonstrate knowledge of Operations Research and its scope, Inventory theory, Replacement problem, Network analysis, Game theory.</i>
❖ <i>Spline Theory</i>	❖ <i>understand Polynomial Interpolation, Piecewise linear approximation, Piecewise cubic interpolation, Truncated power function, Parabolic spline interpolation, The space <math>P_{k,\xi,v}</math> and truncated power basis, The representation of pp and B-splines.</i>
❖ <i>Programming in C</i>	❖ <i>Understand basics of C language, Operators, Control Statements, Scope of Variable, Functions and Pointers.</i>
❖ <i>Advanced Special Function II</i>	❖ <i>Understand Legendre polynomials, Legendre differential equation and its solutions, Bessel function, Hermite polynomial and Laguerre Polynomials.</i>
❖ <i>Integral Transform - II</i>	❖ <i>Application of Application of Laplace Transform to boundary value problems, Application to wave equations, complex fourier transform, Convolution &amp; parseval's identity , Fourier transform of the derivatives , Finite fourier sine &amp; cosine transform.</i>

# Teaching-Learning Resources

- ❖ *Use of modern teaching tools like Power point Presentation, LCD, reference to useful link, You-Tube lectures are regular feature of the department.*
- ❖ *Expert lectures, seminars, workshops and conferences are organized from time to time.*
- ❖ *Remedial coaching is provided to weak students.*
- ❖ *The teachers help students to prepare for various literary and cultural activities for Youth Festival.*