MATHEMATICS DEPARTMENT PROGRAMME SPECIFIC OUTCOME DETAILS.

Programme Specific Outcome of B.Sc., Mathematics

Think in a critical manner.
Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.
Formulate and develop mathematical arguments in a logical manner.
Acquire good knowledge and understanding in advanced areas of mathematics and statistics, chosen by the student from the given courses.
Understand, formulate and use quantitative models arising in social science, business and other contexts.
Course Outcome of B. Sc. Mathematics
Course Outcome of Analytical Geometry 3D and Vector Calculus
Students will able to
Describe the various forms of equation of a plane, straight line, Sphere, Cone and Cylinder.
Find the angle between planes, Bisector planes, Perpendicular distance from a point to a plane, Image of a line on a plane, Intersection of two lines
Define coplanar lines and illustrate
Compute the angle between a line and a plane, length of perpendicular from a point to a line
Define skew lines
Calculate the Shortest distance between two skew lines
Find and interpret the gradient curl, divergence for a function at a given point.
Interpret line, surface and volume integrals
Evaluate integrals by using Green's Theorem, Stokes theorem, Gauss's Theorem
Course Outcome of Theory of Equation, Theory of Numbers and Inequalities
Students will able to
Describe the relation between roots and coefficients
Find the sum of the power of the roots of an equation using Newton’s Method.
Transform the equation through roots multiplied by a given number, increase the roots, decrease the roots, removal of terms
Solve the reciprocal equations.
Analyse the location and describe the nature of the roots of an equation.
Obtain integral roots of an equation by using Newton’s Method.
Compute a real root of an equation by Horner’s method.
Illustrate the Division and Euclidean Algorithm
Describe the properties of prime numbers

Show that every positive integer can be expressed as product of prime power in unique way
Write a formula for the number of positive integers less than n that are relatively prime to n
Define congruence's and describe the properties of congruence's
Find the Sum, product of all the divisors of N.
Find the smallest number with N divisors.
Solve the system of linear congruence's
State Chinese Remainder Theorem, Fermat's and Wilson's theorem
Prove that Arithmetic Mean > Geometric Mean
Prove some simple inequalities by using AM>GM
State and Prove Weirstrass, Schwartz's inequality.
Course Outcome of Complex Analysis
Students will able to
Compute sums, products, quotients, conjugate, modulus, and argument of complex numbers.
Calculate exponentials and integral powers of complex numbers.
Write equation of straight line, circle in complex form
Define reflection points, co cyclic points, inverse points
Understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations.
Determine whether a given function is analytic.
Define Bilinear transformation, cross ratio, fixed point.
Write the bilinear transformation which maps real line to real line, unit circle to unit circle, real line to unit circle.
Find parameterizations of curves, and compute complex line integrals directly.
Use Cauchy's integral theorem and formula to compute line integrals.
Represent functions as Taylor, power and Laurent series.
Classify singularities and poles.
Find residues and evaluate complex integrals, real integrals using the residue theorem.
Course Outcome of Modern Analysis
Students will able to
Define countable, uncountable sets
Write Holders and Minkowski inequality
Define and recognize the concept of metric spaces, open sets, closed sets, limit points, interior point.
Define and Illustrate the concept of completeness
Determine the continuity of a function at a point and on a set.

Differentiate the concept of continuity and uniform continuity
Define connectedness
Describe the connected subset of R.
Define compactness
Characterize the concept of compactness in metric space.
Construct rigorous mathematical proofs of basic results in modern analysis
Course Outcome of Statics
Students will able to
Define Resultant, Component of a Force, Coplanar forces, like and unlike parallel forces, Moment of a force and Couple with examples.
Prove the Parallelogram of Forces, Triangle of Forces, Converse of the Triangle of Forces, Polygon of Forces, Lami's Theorem, Varignon's theorem of moments.
Find the resultant of coplanar couples, equilibrium of couples and the equation to the line of action of the resultant.
Discuss Friction, Forces of Friction, Cone of Friction, Angle of Friction and Laws of friction.
Define catenary and obtain the equation to the common catenary.
Find the tension at any point and discuss the geometrical properties of a catenary.
Course Outcome of Dynamics Students will able to
Define Projectile, impulse, impact and laws of impact.
Prove that the path of a projectile is a parabola.
Find the direct and oblique impact of smooth elastic spheres.
Define Simple Hormonic Motion and find its Geometrical representation.
Find the Composition of Simple Hormonic Motion and the differential equation of a central orbit.
Find the law of force if the orbit is given and vice versa. Course Outcome of Linear Algebra Students will able to.
Define Vector Space, Quotient space Direct sum, linear span and linear independence, basis and inner product.
Discuss the linear transformations, rank, nullity.
Find the characteristic equation, eigen values and eigen vectors of a matrix.
Prove Cayley- Hamilton theorem, Schwartz inequality, Gramschmidt orthogonalisation process.
Solve the system of simultaneous linear equations.Course Outcome of Numerical Analysis Students will able to
Define Basic concepts of operators Δ,E, ∇
Find the difference of polynomial
Solve problems using Newton forward formula and Newton backward formula.

Derive Gauss's formula and Stirling formula using Newton forward formula and Newton backward formula.
Find maxima and minima for differencial difference equation
Derive Simpson's 1/3 ,3/8 rules using trapezoidal rule
Find the solution of the first order and second order equation with constant coefficient
Find the summation of series finite difference techniques
Find the solution of ordinary differential equation of first by Euler,Taylor and Runge-Kutta methods Course Outcome of O.R
Students will able to
Define nature and feature of Operations Research
Find the replacement period of equipment that fails suddenly/gradually
Define EOQ
Find inventory decisions costs using deterministic inventory problems with no shortages /with shortages
Find EOQ problems with price breaks
Define CPM and PERT
Define basic components of Network and find critical path
Define queue charecteristics , transient and steady state
Define Kendal notations solution of queue models (M/M/1):(∞/FIFO),(M/M/1):(N/FIFO)
Define Two persons sum games ,maximin-minimax principle, saddle points.
Find graphical solution of 2×n and m×2 games
Find general solution of m×n rectangular games Course Outcome of Coding Theory
Students will able to
Define basic assumption of binary codes , blocked codes .
Define basic assumption of channel,symmetric codes ,information rate.
Define encoding ,decoding ,CMLD and ICMLD
Define linear codes,subspaces,scalar product andorthogonal complement.
Define REF and RREF and parity check matrix and cosets.
Define hamming bound and generator matrix
Define BCH codes
Define perfect , related codes and cyclic linear codes.
Course Outcome of Mathematical Statistics
Students will able to
Define probability density function, probability distribution
Derive mathematical expectation, binomial, poisson, normal distribution
Solve the problems of large samples and small samples
Discuss the moment generating functions, chi-square distribution

Compute the analysis of variance, one way and two way classifications, Latin square design Course Outcome of Sequence and Series Students will able to
Define different types of sequence.
Discuss the behaviour of the geometric sequence.
Prove properties of convergent and divergent sequence.
Verify the given sequence in convergent and divergent by using behaviour of Monotonic sequence.
Prove Cauchy's first limit theorem, Cesaro's theorem, Cauchy's Second limit theorem.
Explain subsequences and upper and lower limits of a sequence.
Give examples for convergence, divergence and oscillating series.
Discuss the behaviour of the geometric series.
Prove theorems on different test of convergence and divergence of a series of positive terms.
Verify the given series is convergent or divergent by using different test. Course Outcome of Differential equations and its applications Students will able to
Extract the solution of differential equations of the first order and of the first degree by variables separable, Homogeneous and Non-Homogeneous methods.
Find a solution of differential equations of the first order and of a degree higher than the first by using methods of solvable for p, x and y.
Compute all the solutions of second and higher order linear differential equations with constant coefficients, linear equations with variable coefficients.
Solve simultaneous linear equations with constant coefficients and total differential equations.
Form partial differential equations.
Find the solution of First order partial differential equations for some standard types.
Use inverse Laplace transform to return familiar functions.
Apply Laplace transform to solve second order linear differential equation and simultaneous linear differential equations.
Course Outcome of Graph Theory
Students will able to
Describe the origin of Graph Theory.
Illustrate different types of graph theory.
Explain independent sets and covering sets and some basic theorems.
Discuss degree sequences and operations on graphs.
Explain connectedness and components and some theorems.
Characterize tree.
Derive some properties of planarity and Euler's formula.

Find chromatic number and chromatic polynomials for graphs.
Prove Five colour theorem.
Explain basic properties of directed graphs.
Course Outcome of Integral Calculus and Fourier Series
Students will able to
Solve Basic Integral Calculus problems.
Explain properties of definite integrals.
Prove reduction formulae and solve some problems by using this formulae.
Evaluate double and triple integrals.
Apply change variable method to find the value of double and triple integral.
Explain properties of Beta functions.
Derive relation between Beta and Gamma functions.
Evaluate integrals by using Beta and Gamma functions.
Find Fourier series expansions for given functions.
Find Cosine and Sine series expansions for given functions.
Course Outcome of Differential Calculus and Trigonometry
Students will able to
Find Maxima and minima of function of two variables.
Explain subtangent and subnormal.
Find angle of intersition of two curves.
Find circle, radius and centre of curvature.
Expand $\sin n\theta$, $\cos n\theta$ and $\tan n\theta$ by using Demoivre's theorem.
Expand $\cos^n\theta$, $\sin^n\theta$ and $\tan^n\theta$ in terms of θ.
Define hyperbolic functions.
Define inverse hyperbolic functions. Course Outcome of Linear Programming
Students will able to
Define basic feasible solutions, Slack and Surplus variable.
Explain simplex method.
Demonstrate Big-M method
Illustrate two phase method
Prove dual of the dual is primal.
Interpret dual simplex method.
Define transportation problem.
Find a basic feasible solution to the transportation problem by using North west corner rule, Vogel's approximation method.
Apply Modi method to solve transportation problem.
Illustrate Assignment problem and Travelling salesman problem.
Course Outcome of Fuzzy Algebra
Students will able to

Define fuzzy sets, α-cuts, fuzzy complements.
Discuss types of operations on fuzzy sets, t-norms, fuzzy arithmetic.
Explain extension principle of fuzzy sets, fuzzy numbers.
Illustrate fuzzy relations, binary fuzzy relations, fuzzy equivalence relations.
State some applications of fuzzy sets. Course Outcome of Ancillary mathematics I
Students will able to
Define characteristic equation of matrices and illustrate.
State Cayley Hamilton Theorem
Compute inverse of a matrix using Cayley – Hamilton Theorem.•
Find Eigen values and Eigen vectors of a given matrix.
Solve equations of the first order but of higher degree solvable by dy/dx , y, x.
Compute complementary function and particular integral of the type e^{ax}, cos ax, sin ax.
Derive expression for sinnθ, cosnθ and tannθ, $\sin^n\theta$, $\cos^n\theta$
Expand sinθ, cosθ, tanθ in powers of θ
Define hyperbolic and inverse hyperbolic functions
Course Outcome of Ancillary Mathematics –II
Students will able to
Define Moments, Skewness and Kurtosis.
Fit a straight line, Parabola for the given data.
Calculate the correlation coefficient for the given data.
Compute Rank correlation for the given data.
Find intermediate values by using Newton's forward and backward formula and Lagrange's formula.
Apply Laplace transform to solve differential equations
Obtain Fourier series expansions for the given functions.
Compute Cosine and Sine series expansions for the given functions.
Course Outcome of Statistics
Students will able to
Define Moments Skewness and Kurtosis.
Fit a straight line.
Calculate the correlation coefficient for the given data.
Compute Rank correlation for the given data.
Define attributes, consistency of data, independence of data.
Find index numbers for the given data.
Define Probability, Conditional probability.
Derive Baye's theorem.
Course Outcome of Modern Algebra
Students will able to

Define subgroup, center, Normalizer of a subgroup.
Find cycles and transpositions of a given permutations.
Prove Lagrange's theorem ,Euler's theorem and Fermats theorem
Define cyclic groups .
Prove a group has no proper subgroup if it is cyclic group of prime order.
Define normal subgroups , quotient groups and index of a subgroup.
Define homomorphism ,kernel of a homomorphism, isomorphism.
Prove Cayley's theorem , the fundamental theorem of homomorphism for groups
Define rings , zero divisors of a ring , integral domain , field and prove theorems

Programme Specific Outcome of M.Sc., Mathematics

- Create a hypothesis and appreciate how it relates to broader theories.
- Evaluate hypotheses, theories, methods and evidence within their proper contexts.
- Solve complex problems by critical understanding, analysis and synthesis.
- Demonstrate engagement with current research and developments in the subject.
- Critically interpret data, write reports and apply the basics of rules of evidence.
- Select, interpret and critically evaluate information from a range of sources that include books, scientific reports, journals, case studies and the internet.
- Develop proficiency in the analysis of complex physical problems and the use of mathematical or other appropriate techniques to solve them.
- Provide a systematic understanding of the concepts and theories of mathematics and their application in the real world – to an advanced level, and enhance career prospects in a huge array of fields.
- Criticize mathematical arguments developed by themselves and others
- Communicate effectively by oral, written, computing and graphical means.
- Recognize the need to engage in lifelong learning through continuing education and research

Programme Specific Outcome of M.Phil., Mathematics

- ✔ Students will able to
- ✔ Read mathematics independently and solve advanced mathematical problems.
- ✔ Demonstrate mastery of subject material, as evidenced by quality of performance in coursework, and on written and oral examinations in mathematics.
- ✔ Communicate mathematical ideas, results, context, and background effectively and professionally in written and oral form.

- ✔ Produce and defend an original contribution to knowledge, as evidenced by the writing and defence of a thesis involving significant original research.
  Course Outcomes of M.Phil Mathematics
  Course Outcome of Functional Analysis
  Students will able to
- ✔ Recognize the concept of topological vector spaces, seminorm,
- ✔ Characterise the locally convex spaces, metrizable space, normable space.
- ✔ Prove Baire category theorem, Banach-Steinhaus theorem, Open mapping theorem, Closed graph theorem, Hahn Banach Extension and Separation theorem, Banach Alaoglu theorem and Krein Milman theorem .
- ✔ Define Compact operators and state some properties of compact operators.
- ✔ Discuss the spectrum of compact operators. Course Outcome of Research Methodology & Algebra
  Students will able to
- ✔ Classify the types of Research, objectives of the Research.
- ✔ Write report and present report.
- ✔ Define Modules, Free Modules, Project Modules, Flat Modules.•
- ✔ Discuss localization, Ideals, Local Rings.
- ✔ Define Notherian Modules, Primary Decomposition, Artinian Modules, Length of a Module. Course Outcome of Analysis
  Students will able to
- ✔ Define measurable space, measure space.
- ✔ Derive some properties of measures.
- ✔ Prove Fatou's lemma, Lebesgue's Monotone Convergence theorem, Lebesgue Donimated convergence theorem
- ✔ Show the existence of completion of measure space.
- ✔ Describe L_p space, $C_c(X)$, $C_0(X)$.
- ✔ Characterize the positive linear functional on $C_c(X)$.
- ✔ Construct non measurable subset of R.
- ✔ Show that L_p space is complete and the completion of $C_c(X)$ is $C_0(X)$ when X is locally compact space.
- ✔ Prove Lebesgue-Radon-Nikodym theorem, Riesz Representation theorem, Fubini theorem.

Ph.D Mathematics Programme Specific Outcomes

- Generate publications in reputed mathematical journals.

- Provide scope for interaction with international researchers and developing collaborations.
- Demonstrate the highest standard of ethics in research.
- Provide opportunities to research students for communication (and discussion) of advanced mathematical topics to undergraduate and graduate student ts.
- Produce next generation researchers in mathematics.