

PROGRAMME SPECIFIC OUTCOMES, PROGRAMME OUTCOMES AND COURSE OUTCOMES

PG & RESEARCH DEPARTMENT OF MATHEMATICS

B.Sc., MATHEMATICS, M.Sc., MATHEMATICS, EXTRA-CREDIT COURSES & VALUE-ADDED COURSES

PSO, PO & CO STATEMENTS / 2023 onwards

PSOs	PROGRAMME SPECIFIC OUTCOMES	
PSO1	Graduates will acquire a comprehensive knowledge and sound understanding of fundamentals of Mathematics.	
PSO2	Graduates will develop numerical, analytical and mathematical skills.	
PSO3	Graduates will be prepared to acquire a range of general skills, to solve problems, to evaluate information using computers productively to develop software programming and analog to communicate with the society effectively and learn independently.	
PSO4	Graduates will acquire a job efficiently in diverse fields such as Science and Engineering, Education, Banking, Public Services, Business etc.,	
PSO5	Graduates will identify the different roles in an organizational structure of the work place and carry out multiple roles in social responsibilities.	
B.Sc., MATHEMATICS / PROGRAMMES OUTCOMES		
POs	Description of POs	
PO1	To develop important analytical skills and problem solving strategies to assess a broad range of issues in real life.	
PO2	To expose a wide range of modern mathematical ideas from pure and applied mathematics to graduate with both technical and quantitative skills that are in demand in the modern world.	
PO3	To formulate and develop mathematical arguments in a logical manner.	
PO4	To acquire a core of mathematical knowledge and understanding in advanced areas of mathematics from the given courses that provides a solid foundation for future learning	
PO5	To meet the global challenges and accomplish various rewarding positions in the society..	
B.Sc., MATHEMATICS / COURSE OUTCOMES		
	Description of COs	Bloom's Taxonomy / Cognitive Domain
	Classical Algebra and Trigonometry	

CO1.	Define the formation of equation , Descarte's rule of signs, Transformation of Equations, $\sin\theta$, $\cos\theta$, $\tan\theta$, Hyperbolic Functions.	Knowledge (Level K1)
CO2.	Classify Relation between roots and coefficients of equations, Removal of terms, Multiple Roots, $\sin\theta$, Inverse hyperbolic functions.	Comprehension (Level K2)
CO3.	Apply the Theory of equations and Hyperbolic Functions Descarte's rule of signs, cardon's Method , Logarithm of a complex number.	Application (Level K3)
CO4.	Analyze the idea about, theory of equation, trigonometry.	Analysis (Level K4)
CO5.	Show the Relation between roots and coefficients, Descarte's rule of signs, Biquadratic Equations, $\sin\theta$, $\cos\theta$, $\tan\theta$, inverse hyperbolic functions.	Analysis (Level K4)
Differential Calculus		
CO1.	Explain the logic behind the differentiation	Knowledge (Level K1)
CO2.	Solve the Differentiation of implicit function and related problems.	Comprehension (Level K2)
CO3.	Analyze the concepts nth derivatives and Leibnitz theorem	Application (Level K3)
CO4.	Simplify the Tangent and normal Polar curves-p-r equations-Curvature.	Analysis (Level K4)
CO5.	Distinguish of Evolute–Envelope–Maxima and Minima of function.	Analysis (Level K4)
Aptitude for Competitive Examination-I		
CO1.	remember the meaning of HCF and LCM of numbers.	Knowledge (Level K1)
CO2.	understand the basic concepts of Quantitative ability	Understand (Level K2)
CO3.	understand the basic concepts of logical reasoning	Understand (Level K2)
CO4.	apply the concepts of percentage in profit & loss in real life problems..	Application (Level K3)
CO5.	analyze the concepts of problems on ages	Analysis (Level K4)
Vedic Mathematics		
CO1.	Remembering various techniques in Vedic Mathematics	Knowledge (Level K1)
CO2.	Understanding the steps involved in each technique	Understand (Level K2)
CO3.	Solving general equations	Application (Level K3)
CO4.	Analyzing the different methods available for effective calculation	Analysis (Level K4)
CO5.	Exploring the Vedic sutras in arithmetic.	Analysis (Level K4)
Analytical Geometry 2D&3D		
CO1.	Find the logic behind the straight lines, Polar coordinates,AnalyticalGeometry3D,Sphere,Coneandcylinder.	Knowledge (Level K1)

CO2.	Give example of Straight line, Polar coordinates, Coplanarity of straight line, Tangent plane, Equation of Cone.	Understand (Level K2)
CO3.	Analyze the concept of straight lines in 2D&3D, coplanarity and shortest distance between two lines.	Application (Level K3)
CO4.	Calculate the Simple problems, Polar Equation of a conic, Equation of S.D between two lines, Tangency of Spheres, Quadric Cone with the Vertex at the origin.	Analysis (Level K4)
CO5.	Analyze the cone and cylinder concepts to the 2D&3D problems.	Analysis (Level K4)
Integral Calculus		
CO1.	Explain the logic behind the concept of Integration	Knowledge (Level K1)
CO2.	Solve the Definite Integral and Integration by Parts Problems.	Understand (Level K2)
CO3.	Analyze the Reduction formula	Analysis (Level K4)
CO4.	Simplify the multiple integrals and its problems.	Analysis (Level K4)
CO5.	Distinguish of Beta and Gamma Functions in evaluation of Double and Triple Integrals.	Application (Level K3)
Aptitude For Competitive Examinations-II		
CO1.	remember the meaning of partnership	Knowledge (Level K1)
CO2.	understand the basic concepts of Quantitative ability	Understand (Level K2)
CO3.	understand the basic concepts of logical reasoning	Understand (Level K2)
CO4.	Apply the concepts of time and work on real life problems	Application (Level K3)
CO5.	analyze the concepts of boats and streams	Analysis (Level K4)
Mathematics for Competitive Examinations-I		
CO1.	Identify the logic behind Numbers, Simplification, Problems on Numbers, Percentage, Partnership	Knowledge (Level K1)
CO2.	Give Example H.C.F & L.C.M of Numbers, Square roots and Cube roots, Problems on Ages, Profit and Loss, Chain Rule	Understand (Level K2)
CO3.	Discover the problems on Decimal Fractions, Average, Surds & Indices ,Ration and Proportions, Time and Work	Application (Level K3)
CO4.	Show the Numbers, Square roots and Cube roots, Problems on Numbers ,Ration and Proportions, Chain Rule Problems.	Analysis (Level K4)
CO5.	Simplify Develop the problems on Percentage, Profit and Loss, Ration and Proportions and its problem.	Analysis (Level K4)
Vector Analysis		
CO1.	Define Vector Point function, Line Integral, Dirichlet's Conditions	Knowledge (Level K1)
CO2.	Classify scalar point function, Surface integral, General	Understand (Level K2)

CO3.	Apply the Derivative of sum of vectors, Volume Integral.	Understand (Level K2)
CO4.	Analyze the derivative of scalar Product, Stoke's Theorem,	Application (Level K3)
CO5.	Show the Solenoidal and irrational functions, Green's Theorem in two dimension.	Analysis (Level K4)
Differential Equations		
CO1.	Identify the first order differential equation and its solutions	Knowledge (Level K1)
CO2.	Illustrate the standard form of differential equations	Understand (Level K2)
CO3.	Idea behind the Homogenous equations and Lagrange equations	Understand (Level K2)
CO4.	Formulate the Partial differential equations and Derivation of partial differential equations by elimination of constants, arbitrary functions	Application (Level K3)
CO5.	Execute the standard type of Partial differential equations	Analysis (Level K4)
Mathematical Statistics – I		
CO1.	Calculate mean, median and mode	Knowledge (Level K1)
CO2.	Acquire the knowledge by using Binomial distribution, Poisson distribution etc..	Knowledge (Level K1)
CO3.	Understand random variables and probability distributions.	Comprehension (Level K2)
CO4.	Use the different methods of finding the correlation coefficient.	Application (Level K3)
CO5.	Compute expected value and variance of discrete and continuous random variables.	Analysis (Level K4)
Mathematics for Competitive Examinations-II		
CO1.	State the Pipes and Cisterns, Boats and Streams, Compound Interest, Volume and Surface,.	Knowledge (Level K1)
CO2.	Illustrate the Time and Distance, Alligation or mixture, Logarithms ,Clock and Calender, Probability	Understand (Level K2)
CO3.	Solve the Problems on Trains, Simple Interest, Area,.	Understand (Level K2)
CO4.	Apply the Boats and Streams, Alligation or mixture, Simple Interest.	Application (Level K3)
CO5.	Show the Area, Volume and Surface Area	Analysis (Level K4)
Business Optimization Techniques		
CO1.	Identify the Problems with n Jobs through Two Machines, Basic Terms, Reasons for Maintaining Inventories, Queuing System, Payoff–types of games.	Knowledge (Level K1)
CO2.	Classify the Processing N Jobs through three Machines A,B,C Common Errors, Inventory Costs, Kendall's Notation for Representing Queuing Models, The Maximin–Minimax Principal.	Understand (Level K2)
CO3.	Apply the Problems with N Jobs and K Machines, Numbering the Events, Other Factors Involved in Inventory Analysis, Classification of Queuing Models, Games without Saddle Points.	Application (Level K3)

CO4.	Analyze the Problems with 2 Jobs through K Machines, Programme Evaluation and Review Technique, Deterministic Inventory Model, Games without Saddle Points.	Analysis (Level K4)
CO5.	Show the Cost Consideration In PERT/CPM ,Re-order Level an Optimum Buffer Stock.	Analysis (Level K4)
Transforms Techniques		
CO1.	Define Laplace Transform and its properties	Knowledge (Level K1)
CO2.	Classify the idea of the inverse Laplace transform and its applications.	Understand (Level K2)
CO3.	Apply the Fourier Transform and related problems.	Application (Level K3)
CO4.	Analyze the Parsevals identities and the boundary value problem	Analysis (Level K4)
CO5.	Show the Condition for Z-Transform and its problems.	Analysis (Level K4)
Elements of Mathematical Analysis		
CO1.	Define Functions, Bounded sequences, Series of real numbers, Limits and Metric spaces , Open sets And closed sets.	Knowledge (Level K1)
CO2.	Demonstrate the Real Valued functions, Monotonic sequences ,convergence and divergence, metrics paces limits in metric spaces, Discontinuous Functions on \mathbb{R} .	Understand (Level K2)
CO3.	Examine countability, operations on convergent sequences, alternating series, Continuous functions On metric spaces, Connected sets.	Application (Level K3)
CO4.	Differentiate the Convergent sequences and Divergent Sequences, Cauchy sequences, Rearrangement of series, Reformulation, Bounded sets and Totally Bounded sets.	Analysis (Level K4)
CO5.	Analyze the Convergent sequences and Divergent Sequences, Cauchy sequences, Rearrangement of series, Reformulation, Bounded sets and Totally Bounded sets.	Analysis (Level K4)
Mathematical Statistics - II		
CO1.	Acquiring knowledge of continuous random variables and testing hypothesis	Knowledge (Level K1)
CO2.	Understand the concepts of t, F, z-distributions and its applications and acquire the knowledge by using Normal distribution.	Understand (Level K2)
CO3.	Demonstrate the use of chi-square distribution	Application (Level K3)
CO4.	Analyze the concepts of sampling techniques and procedure for testing of hypothesis for large samples.	Analysis (Level K4)
CO5.	Analyze the association between two or more groups and populations.	Analysis (Level K4)
Mathematics for Competitive Examinations-III		
CO1.	Acquire the basic knowledge of area and volume	Knowledge (Level K1)

CO2.	understand the basic concepts of Quantitative ability	Understand (Level K2)
CO3.	understand the basic concepts of logical reasoning	Understand (Level K2)
CO4.	Apply the problems on train with solved examples	Application (Level K3)
CO5.	Analyze the concepts of simple and compound interest in real life	Analysis (Level K4)
Mathematics for Competitive Examinations-IV		
CO1.	State the Races and games of skills and Stocks and Shares.	Knowledge (Level K1)
CO2.	Illustrate the Permutation and combination, Probability	Understand (Level K2)
CO3.	Solve the Problems on True discount And Bankers Discount.	Application (Level K3)
CO4.	Apply the Heights and Distances, Odd Man Out and series.	Analysis (Level K4)
CO5.	Show the Tabulation, Bar Graphs.	Analysis (Level K4)
Abstract Algebra		
CO1.	Define Groups, Normal Subgroups, Rings, Sub Rings, Integral Domain.	Knowledge (Level K1)
CO2.	Give Example of Subgroups, Quotient groups, Elementary Properties of Rings, Ideals, Order Integral Domain.	Understand (Level K2)
CO3.	Apply the Cyclic groups, Isomorphism, Types of Rings, Maximum and Prime Ideals, Euclidean Domain.	Application (Level K3)
CO4.	Analyze Order of an elements, Permutation groups, Characteristic of a Ring, Homomorphism of Rings, Every P.I. D is a U.F.D, Co sets and Lagrange's Theorem, Unique factorization Domain.	Analysis (Level K4)
CO5.	Differentiate the Order of an elements, Permutation groups, Characteristic of a Ring, Homomorphism of Rings, Every P.I.D is a U.F.D, Cosets and Lagrange's Theorem, Unique factorization Domain.	Analysis (Level K4)
Real Analysis		
CO1.	Define Complete metric spaces, Sets of measure zero, Rolle's theorem, Hyperbolic Functions, The Binomial Theorem.	Knowledge (Level K1)
CO2.	Express the Compact metric spaces, Riemann integral, Law of Mean, The Exponential Function Logarithmic Function, L'Hospital Rule.	Understand (Level K2)
CO3.	Apply the Continuous functions on Compact Metric spaces, Existence of Riemann integrals, Improper integrals, Trigonometric Function, uniform, convergence of sequence of functions.	Application (Level K3)
CO4.	Analyze the Continuity of the inverse functions–Uniform continuity. Properties of Riemann integrals, Theorems on Improper integrals, Taylors Theorem, consequences of uniform convergences.	Analysis (Level K4)

CO5.	Discover the Complete metric spaces, Existence of Riemann integrals, Derivatives, Uniform continuity.	Analysis (Level K4)
Mathematical Modeling		
CO1.	Find the Ordinary differential equation, Modeling in population dynamics, Modeling in second order O.D.E. Modeling through difference equations, Modeling through graphs.	Knowledge (Level K1)
CO2.	Give Example Linear growth model, Prey predator models, Modeling of planetary motion, Linear difference equation, representing results of tournament.	Understand (Level K2)
CO3.	Generalize the Non-linear growth and decay models, Multi-species models , Circular motion , Harrod model , Food web–Communication network.	Application (Level K3)
CO4.	Analyze the Diffusion of glucose or a medicine in the blood stream, A model for diabetic mellitus, Elliptic motion of a satellites, Applications of Actuarial science, Terms of Signed graph.	Analysis (Level K4)
CO5.	Sketch out the Diffusion of glucose or a medicine in the bloodstream, A model for diabetic mellitus, Elliptic motion of a satellites, Detection of clique, Terms of signed graph.	Analysis (Level K4)
Optimization Techniques		
CO1.	Acquire the knowledge of Transportation and Assignment problems.	Knowledge (Level K1)
CO2.	understand duality theorems and dual simplex method.	Understand (Level K2)
CO3.	Use the Simplex Method or the Big M Method to solve linear programming problems.	Application (Level K3)
CO4.	Analyze and interpret results of transportation and problem using appropriate method	Analysis (Level K4)
CO5.	Analyze the concept of complementary slackness and its role in solving primal / dual problem.	Analysis (Level K4)
Astronomy		
CO1.	Identify the Standard formulae in Spherical Trigonometry, Astronomical Refraction ,Kepler'slaws of Planetary motion, Fixing the Ecliptic, Eclipses.	Knowledge (Level K1)
CO2.	Demonstrate the Celestial sphere, Tangent and Cassini's formulae ,Newton's deductions from Kepler's Laws ,the position of the First point of Aries Lunar eclipses.	Understand (Level K2)
CO3.	Explain the Celestial co-ordinates and their conversions, Geocentric parallax Equation of Time, The Moon, Different phases, Stellar universe.	Application (Level K3)
CO4.	CalculatetheZonesofEarth-Dip,Twilight,Heliocentricparallax,Conversionoftime,Metoniccycle,Tides,Stellaruniverse.	Analysis (Level K4)
CO5.	Analyze the Zones of Earth-Dip, Twilight, Heliocentric parallax, Conversion of time, Metonic cycle, Tides, Stellar universe.	Analysis (Level K4)

Numerical Methods		
CO1.	Acquiring knowledge of basic idea of the solution of algebraic and transcendental equations.	Knowledge (Level K1)
CO2.	Understand the Solution of simultaneous linear algebraic equations.	Understand (Level K2)
CO3.	Demonstrate understanding of the Importance of interpolation	Understand (Level K2)
CO4.	Develop the idea about the Numerical Differentiation and integration.	Application (Level K3)
CO5.	Understanding the Numerical solution of Ordinary differential equation	Application (Level K3)
Difference Equations with Applications		
CO1.	Define the theory of Difference Calculus for building applications.	Knowledge (Level K1)
CO2.	Illustrate the theory of Linear Difference Equations and its related results.	Understand (Level K2)
CO3.	Demonstrate the Linear Difference Equations and properties of difference equation.	Understand (Level K2)
CO4.	Implement method for Initial value Problems for linear systems, Stability of linear systems.	Application (Level K3)
CO5.	Apply Asymptotic analysis of sums and its applications.	Application (Level K3)
Linear Algebra		
CO1.	Define Polynomial Rings over U.F.D, Span of a Set, Matrix of a Linear, Transformation, Algebra of Matrices.	Knowledge (Level K1)
CO2.	Give Example Polynomial Over Q, Linear Independent, Inner product spaces, Types of Matrices, Simultaneous Linear Equations.	Comprehension (Level K2)
CO3.	Analyze the Vector Spaces, Basis and Dimension, Orthogonality, The Inverse of a Matrix, Characteristic Equations.	Application (Level K3)
CO4.	Classify the Subspaces, Rank and Nullity, Orthogonal complement, Elementary Transformations, Cayley's Hamilton Theorem.	Analysis (Level K4)
CO5.	Estimate the Linear Transformations, Orthogonal Complement, Eigen Values and Eigen Vectors.	Analysis (Level K4)
Complex Analysis		
CO1.	Identify the Functions of a complex variable, Elementary transformations, Sequence & Series, Definite integral, Residues.	Knowledge (Level K1)
CO2.	Classify the Limits, Bilinear transformations, Sequences and series of functions, Cauchy's theorem, Cauchy's Residue theorem.	Understand (Level K2)
CO3.	Apply the Differentiability, Fixed points of bilinear transformations, Some special bilinear transformations, Power series, Cauchy's integral formula, Evaluation of definite integrals.	Application (Level K3)
CO4.	Examine the Harmonic functions, Mapping by elementary functions, Taylor's series, Contour integral, Higher derivatives.	Analysis (Level K4)

CO5.	Calculate the Complex Numbers And Analytical Functions, Power Series And Series Expansions, Complex Integration , Calculus of Residues.	Analysis (Level K4)
Mechanics		
CO1.	Define the force, law of force and lami theorem.	Knowledge (Level K1)
CO2.	Classify the Parallel forces and couples	Understand (Level K2)
CO3.	Apply the idea of Friction and related problems.	Application (Level K3)
CO4.	Analyze the concept of Projectiles and its characterization	Analysis (Level K4)
CO5.	Show the Direct impact and Oblique impact problems	Analysis (Level K4)
Object Oriented Programming with C++		
CO1.	Identify the concept of classes and objects	Knowledge (Level K1)
CO2.	Understand the practice of object oriented programming in the construction of robust maintainable programs which satisfy the requirements.	Understand (Level K2)
CO3.	Apply the concepts of object-oriented programming	Application (Level K3)
CO4.	Apply C++ programming and program development within an integrated development environment.	Application (Level K3)
CO5.	Analyze the use of operator overloading and type conversions	Analysis (Level K4)
Combinatorial Mathematics		
CO1.	Identify the logic behind the Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	Knowledge (Level K1)
CO2.	Demonstrate the idea about Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	Understand (Level K2)
CO3.	Develop the concepts of Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	Application (Level K3)
CO4.	Analyze the idea in Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	Analysis (Level K4)
CO5.	Apply the concepts of Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	Application (Level K3)
Graph Theory		
CO1.	Define Degrees, Walks , Trails and Paths, Eulerian Graphs ,Characterization of Trees, Characterization of Planar Graphs.	Knowledge (Level K1)
CO2.	Illustrate the Sub graphs ,Connectedness, Eulerian Graphs ,Characterization of Trees, Thickness.	Understand (Level K2)
CO3.	Discover the Operations on Graphs, components, Hamiltonian Graphs, Center of a Tree, Crossing and Outer Planarity	Application (Level K3)

CO4.	Classify the Operations on Graphs, Blocks – Connectivity, Hamiltonian Graphs, Center of a Tree, Crossing and Outer Planarity .	Analysis (Level K4)
CO5.	Conclude the Operations on Graphs, Blocks – Connectivity, Hamiltonian Graphs, Center of a Tree, Crossing and Outer Planarity .	Analysis (Level K4)
Fuzzy Set and Applications		
CO1.	Identify the logic behind the execution of the form classical sets to fuzzy sets; Fuzzy sets versus crisp sets	Knowledge (Level K1)
CO2.	Understand the concepts of an operations on fuzzy sets.	Understand (Level K2)
CO3.	Analyze the concept of fuzzy arithmetic	Application (Level K3)
CO4.	Develop the idea about the fuzzy relations	Analysis (Level K4)
CO5.	Apply the concepts to the fuzzy logic and its related theorems.	Application (Level K3)
Programming in C		
CO1.	Remember Data Types, Constant and Variables & Functions.	Knowledge (Level K1)
CO2.	Understand the concepts of Conditional and looping Statements	Understand (Level K2)
CO3.	Apply the concept of Functions, Storage Classes, and Files in a program.	Application (Level K3)
CO4.	Evaluate the working of Arrays, Structures and String.	Evaluate (Level K5)
CO5.	Create a file program using Pointers.	Create (Level K6)
Allied Mathematics-I / (B.Sc., Physics & Chemistry) Theory of Equations, Matrices, Finite Differences, Trigonometry and Differential Calculus		
CO1.	Remember numbers, sequences, series, basic summaries from partial fraction, equations, matrices	Knowledge (Level K1)
CO2.	Understand trigonometric values and Interpolations	Understand (Level K2)
CO3.	Solve problems by using theorems	Application (Level K3)
CO4.	Analyze homogeneous and non-homogeneous linear equations	Application (Level K3)
CO5.	Analyze and Evaluate inverse functions.	Analysis (Level K4)
Allied Mathematics-II / (B.Sc., Physics & Chemistry) Integral Calculus, Differential Equations, Laplace Transforms & Vector Analysis.		
CO1.	Understand the I and II integrals	Knowledge (Level K1)
CO2.	Understand properties of integrals, Laplace transform.	Understand (Level K2)
CO3.	Understand first order differential equations.	Application (Level K3)
CO4.	Analysis Theorems and proves.	Application (Level K3)
CO5.	Evaluate the importance of shifting properties	Analysis (Level K4)
Enhancement Compulsory Course–I:Environmental Studies		

CO1.	State the concepts of the ecosystem, natural resources, biodiversity, pollution and Social Issues in the Environment.	Knowledge (Level K1)
CO2.	Describe the environment in terms of ecosystem and its structural and functional aspects. Also explore the interconnectedness among all the biotic and a biotic components of the environment and the dynamic nature of the ecological processes for sustainable development	Understand (Level K2)
CO3.	Demonstrate and apply various concepts in the environmental systems and issues at local, regional, and global levels	Application (Level K3)
CO4.	Analyze various types of ecosystem, resources, biodiversity, pollution, and environmental regulations for a healthy environment	Analysis (Level K4)
Value Education		
CO1.	Understand the importance of value based living	Understand (Level K2)
CO2.	Analyze the art of nurturing the life and mind frequency	Analysis (Level K4)
CO3.	Understand the purpose of philosophy of life and analyze the moralization of desires.	Understand (Level K2)
CO4.	Analyze the responsible citizens with clear conviction to practice values and ethics in life	Analysis (Level K4)
CO5.	Understand and apply the law of nature	Application (Level K3)
EXTRA-CREDIT COURSES		
Non Verbal Reasoning for Competitive Examinations		
CO1.	Memorize the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern, Figure Matrix	Knowledge (Level K1)
CO2.	Classify the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern, Figure Matrix	Understand (Level K2)
CO3.	Apply the Series, Analogy, Classification, Analytical reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern, Figure Matrix	Application (Level K3)
CO4.	Calculate the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern, Figure Matrix .	Analysis (Level K4)
CO5.	Simplify the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern, Figure Matrix .	Analysis (Level K4)
Solar System and Stellar Universe		
CO1.	Acquire the knowledge of Sun and Planets.	Knowledge (Level K1)
CO2.	Understand the concepts of comets, Meteors, Zodiacal	Understand (Level K2)
CO3.	Understand the Stellar universe	Application (Level K3)

CO4.	Analyze the different kinds of Eclipses	Analysis (Level K4)
CO5.	Analyze the concept of Zodiacal Constellation	Analysis (Level K4)
Set Theory and Logic		
CO1.	Acquire the concept of Basic set operations	Knowledge (Level K1)
CO2.	Understand the concept of Equivalence relation	Understand (Level K2)
CO3.	Analyse Tautology and Contradiction	Application (Level K3)
CO4.	Apply the concept of conjunction and disjunction	Analysis (Level K4)
CO5.	Analyze the concept of logically true and logically Equivalent statement	Analysis (Level K4)
VALUE-ADDED COURSES		
Verbal Reasoning for Competitive Examinations		
CO1.	Identify the Series Completion, Blood Relations, Logical Venn Diagrams, Assertion and Reason	Knowledge (Level 1)
CO2.	Classify the Coding Direction Sense Test, Mathematical Operations, Inserting the Missing Character, Verification of Truth of the Statement	Evaluation (Level 5)
CO3.	Examine the Decoding ,Blood Relations, Inserting the Missing Character	Knowledge (Level 1)
CO4.	Estimate the Logical Venn Diagrams, Verification of Truth of the Statement, Arithmetical Reasoning	Application (Level 3)
CO5.	Calculate the Logical Venn Diagrams, Verification of Truth of the Statement, Arithmetical Reasoning	Analysis (Level K4)
Coding Theory		
CO1.	Understand the concept of Error detection, correction and decoding	Knowledge (Level K1)
CO2.	Apply the concept of Linear Codes , Hamming weight and Bases for linear codes	Application (Level K 3)
CO3.	Get a clear idea about the concepts of Finite Fields	Analysis (Level K4)
CO4.	Understand the concept of Generator matrix and Check matrix	Knowledge (Level 1)
Mathematics for Environmental Studies		
CO1.	Understand the concept of Fibonacci numbers in nature	Knowledge (Level K1)
CO2.	Study the Different types of Fibonacci and Lucas numbers and its applications.	Application (Level K3)
CO3.	Apply the concepts of golden ratio	Application (Level K3)
CO4.	Analyze the concept of Gattei's discovery of golden ratio	Analysis (Level K4)
M. Sc. Mathematics		
Program Specific Outcomes (PSOs)		
PSO1	Communicate concepts of Mathematics and its applications.	
PSO2	Acquire analytical and logical thinking through various mathematical tools and techniques.	
PSO3	Investigate real life problems and learn to solve them through formulating mathematical models.	
PSO4	Attain in-depth knowledge to pursue higher studies and ability to conduct research. Work as mathematical professional	

PSO5	Achieve targets of successfully clearing various examinations/interviews for placements in teaching, banks, industries and various other organizations/services.	
Program Outcomes (POs)		
Description of POs		
PO1	Demonstrate in-depth knowledge of Mathematics, both in theory and application.	
PO2	Attain the ability to identify, formulate and solve challenging problems in Mathematics.	
PO3	Know the various specialized areas of advanced mathematics and its applications.	
PO4	Analyze complex problems in Mathematics and propose solutions using research- based knowledge.	
PO5	Obtain the accurate solutions for the community oriented problems via various mathematical models.	
PO6	Work individually or as a team member or leader in uniform and multidisciplinary settings.	
PO7	Crack lectureship and fellowship exams affirmed by UGC like CSIR-NET and SET.	
PO8	Apply the Mathematical concepts, in all the fields of learning including higher research, and recognize the need and prepare for lifelong learning.	
PO9	Know the use of computers both as an aid and as a tool to study problems in Mathematics.	
PO10	Inculcate the knowledge of formulation and apply the mathematical concepts which are suitable for real life applications.	
M.Sc., Mathematics/COURSE OUTCOMES		Bloom's Taxonomy/ Cognitive Domain
Description of COs		
Algebraic Structures		
CO1	Understand Sylows theorem and its applications	Apply (Level K3)
CO2	Formulate some special types of rings and their properties.	Create (Level K6)
CO3	Acquire knowledge on extension fields and roots of polynomials	Analyze (Level K4)
CO4	Analyze the elements of Galois theory and Galois Groups over the rational	Analyze (Level K4)
CO5	Understand the basic concepts of solvability by radicals and finite fields.	Understand (Level K2)
Real Analysis-I		
CO1	Apply the Riemann Stieltjes integral and bring its properties and rectifiable curves.	Apply (Level K3)
CO2	Remembering of sequences and series along with its properties	Remember(Level K1)
CO3	Analyze the concept of linear transformation and find the extreme values of implicit functions.	Analyze (Level K4)
CO4	Understand the fundamental concept of Lebesgue measure.	Understand (Level K2)
CO5	Evaluate the complex integration and the benefits of Lebesgue Integral	Evaluate (Level K5)
Ordinary Differential Equations		

CO1	Recall the types of linear homogeneous equations of second order equations with constant coefficients and apply the method to solve.	Remember(Level K1)
CO2	Analyze non-homogeneous ODE using the method of undermined coefficients and annihilator method to solve the same.	Analyze (Level K4)
CO3	Understand and Apply the theorems on Initial value problem to ordinary differential equations.	Apply (Level K3)
C04	Comprehend the Euler equations, the Bessel's equation and Regular, Singular points at infinity and to evaluate.	Evaluate (Level K5)
CO5	Identify the research problem where differential equation can be used to model the problem.	Create (Level K6)
Elective-I: Graph Theory And Applications		
CO1	Understand the basic concepts of Graphs and Trees	Understand (Level K2)
CO2	Analyze vertex and edge connectivity concepts	Analyze (Level K4)
CO3	Acquire knowledge in Matching and Colourings	Analyze (Level K4)
C04	Apply Chromatic Number	Apply (Level K3)
CO5	Determining the planar, non-planar, and directed graphs	Evaluate (Level K5)
Elective-I: Numerical Methods		
CO1	Solve problems in numerical differentiation and integration	Apply (Level K3)
CO2	Solve system of equations using various methods.	Apply (Level K3)
CO3	Apply various methods to find numerical solution of first and second order ordinary differential equations.	Apply (Level K3)
C04	Explain the various methods for solving Boundary Value Problems and Characteristic Value Problems	Understand (Level K2)
CO5	Understand the Explicit method and the Crank Nicolson method for solving partial differential equations.	Understand (Level K2)
Elective-II: Fuzzy Logic And Fuzzy Sets		
CO1	Gain knowledge about the basic types of fuzzy sets and the difference between crisp sets and fuzzy sets and the concept of operations on fuzzy sets	Remember(Level K1)
CO2	Analyze and apply the knowledge of fuzzy relations.	Analyze (Level K4)
CO3	Develop the basic concepts of fuzzy measures.	Create (Level K6)
C04	Explore the concept of uncertainty. .	Create (Level K6)
CO5	Understand the types of uncertainty measures and principles	Apply (Level K3)
Elective-II: Mathematical Programming		
CO1	Understand the formulation of linear programming problem.	Understand (Level K2)
CO2	Remember various techniques to solve real life problem.	Remember(Level K1)
CO3	Understand and solve the non-linear programming problem.	Understand (Level K2)
C04	Apply the fundamental concepts of Parametric Programming and Integer Linear Programming	Apply (Level K3)

Advanced Algebra		
CO1	On the successful completion of the course, student will be able to	
CO2	Understand the basic concepts of Linear transformations, characteristic roots and matrices of linear transformation and its applications.	Understand (Level K2)
CO3	Explain about the algebra of polynomials, polynomial ideals and prime factorization of a polynomial.	Analyze (Level K4)
CO4	Understand the basic concepts of determinants and its additional properties.	Understand (Level K2)
CO5	Recognize the concepts of Invariant subspaces and diagonalization process.	Evaluate (Level K5)
CO6	Analyze canonical Form, Jordan Form and Rational canonical Form.	Analyze (Level K4)
Real Analysis-II		
CO1	Apply the Riemann Stieltjes integral and bring its properties and rectifiable curves.	Apply (Level K3)
CO2	Remembering of sequences and series along with its properties	Remember(Level K1)
CO3	Analyze the concept of linear transformation and find the extreme values of implicit functions.	Analyze (Level K4)
CO4	Understand the fundamental concept of Lebesgue measure.	Understand (Level K2)
CO5	Evaluate the complex integration and the benefits of Lebesgue Integral	Evaluate (Level K5)
Partial Differential Equations		
CO1	Understand and remember the physical situations with real world problems to construct mathematical models using partial differential equations and study the methods to solve.	Understand (Level K2)
CO2	Analyze the type of partial differential equations and different methods to solve.	Analyze (Level K4)
CO3	Evaluate Laplace equation and analyze its applications.	Evaluate (Level K5)
CO4	Apply variable separable method to solve Laplace and Diffusion equation	Apply (Level K3)
CO5	Finding the appropriate method to solve the partial differential equations	Create (Level K6)
Elective-III: Mathematical Statistics		
CO1	Remembering the understanding the basic concepts such as statistics, probability and random variables.	Remember(Level K1)
CO2	Applying the concepts and methods to find the moments of the distributions.	Apply (Level K3)
CO3	Study multivariate distributions and the independence of random variables. Further evaluating the marginal distributions from bivariate distributions.	Evaluate (Level K5)
CO4	Analyze and study the properties of some discrete as well as continuous distributions	Analyze (Level K4)
CO5	Understand the convergence of distributions and central limit theorem.	Understand (Level K2)
Elective-III: Statistical Data Analysis Using R Programming		
CO1	Apply R programming and understand different data sets	Apply (Level K3)
CO2	Apply R Programme and construct graphs and charts	Apply (Level K3)
CO3	Analyze the data and know descriptive statistics by using R Programming	Analyze (Level K4)

C04	Apply R Programming to test the hypothesis of the study	Apply (Level K3)
CO5	Predict the data and take decisions through R programming.	Evaluate (Level K5)
Elective-IV: Modelling and Simulation		
CO1	Describe the role of important elements of discrete event simulation and modeling paradigm.	Analyze (Level K4)
CO2	Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.	Understand (Level K2)
CO3	Develop skills to apply simulation software to construct and execute goal-driven system models.	Create (Level K6)
C04	Interpret the model and apply the results to resolve critical issues in a real world environment	Analyze (Level K4)
Elective-IV: Neural Networks		
CO1	Understand and analyze different neuron network models	Analyze (Level K4)
CO2	Understand the basic ideas behind most common learning algorithms for multilayer perceptions, radial-basis function networks.	Understand (Level K2)
CO3	Describe Hebb rule and analyze back propagation algorithm with examples.	Analyze (Level K4)
C04	Study convergence and generalization and implement common learning algorithm,	Understand (Level K2)
CO5	Study directional derivatives and necessary conditions for optimality and to evaluate quadratic functions.	Evaluate (Level K5)
Skill Enhancement Course- NME -I-Office Automation And ICT Tools (Practical)		
CO1	Acquire practical knowledge about MS-Word, MS-Excel,	Understand (Level K2)
CO2	Understand about MS-Power Point and Ms-Access.	Understand (Level K2)
CO3	Apply mathematical symbols into MS-word and MS-Power point.	Apply (Level K3)
Complex Analysis		
CO1	Remembering the concept of Analytic function and as a mapping on the plane.	Remember(Level K1)
CO2	Understand Cauchy's Integral Formula on open sets on the plane and know about poles , residues and singularities.	Understand (Level K2)
CO3	Apply the Cauchy's integral formula in residue theorems and in evaluation of definite integrals.	Analyze (Level K4)
C04	Analyze and represent the sum function of a power series as an Analytic Function.	Evaluate (Level K5)
CO5	Study and Understand periodic function, Weierstrass \square function and its applications.	Evaluate (Level K5)
Probability Theory		
CO1	Remembering the understanding the basic concepts such as statistics, probability and random variables.	Understand (Level K2)
CO2	To solve Regression of the first and second types.	Evaluate (Level K5)
CO3	To solve problems on Cauchy and Laplace distributions.	Evaluate (Level K5)
C04	To explain and solve problems on Kolmogorov Inequality and Kolmogorov Strong Law of large numbers.	Analyze (Level K4)

Topology		
CO1	Acquire knowledge about various types of topological spaces and their properties	Analyze (Level K4)
CO2	Discuss connected spaces, the components of a space	Understand (Level K2)
CO3	Apply the properties and derive the proofs of theorems.	Apply (Level K3)
CO4	Construct a variety of examples and counter examples in topology	Create (Level K6)
CO5	Understand the properties of the compact spaces and analyse the different types of compactness.	Analyze (Level K4)
Mechanics		
CO1	Understand the basic concepts of the mechanical system, generalized coordinates, work, energy and momentum.	Understand (Level K2)
CO2	Solve and analyze the Lagrange's equations and integrals of motion with examples.	Evaluate (Level K5)
CO3	Understand the Hamilton's Principle and other variation principles and gain ability to analyze those principles to the problems arising in practical situations	Understand (Level K2)
CO4	Understand and develop the Hamilton's Principal function and Hamilton Jacobi equation	Create (Level K6)
CO5	Get familiar with canonical transformations, conditions of canonicity of a transformation in terms of Lagrange and Poisson brackets	Evaluate (Level K5)
Elective-V- Fluid Dynamics		
CO1	Recall the basic concepts of velocity, density and curvilinear co-ordinates.	Remember(Level K1)
CO2	Understand the concepts and equations of fluid dynamics	Understand (Level K2)
CO3	Analyze and understand the concepts of the force experienced by a two- dimensional fixed body in a steady irrotational flow.	Understand (Level K2) & Analyze (Level K4)
CO4	Analyze the approximate solutions of the Navier – Stokes equation.	Analyze (Level K4) & Evaluate (Level K5)
CO5	Analyze and apply the appropriate method to solve integral equation of boundary layer, Blasius equation and its series solution.	Apply (Level K3) Analyze (Level K4)
Elective-V- Stochastic Processes		
CO1	Acquire adequate knowledge about Continuous Time Markov Chain and Queueing Systems.	Remember(Level K1)
CO2	Gain understanding on the Renewal Process, Cumulative Process and SemiMarkov Process.	Understand (Level K2) & Apply (Level K3)
CO3	Apply different methods and solve Birth and Death queues.	Apply (Level K3)
CO4	Examine the computations of M/G/1 and G/M/1 Queues and Network of Queues.	Evaluate (Level K5)
CO5	Conclude the idea of Brownian Motion and First Passage Times.	Analyze (Level K4) & Evaluate (Level K5)

Skill Enhancement Course- NME-II : Mathematical Documentation Using Latex		
CO1	Understand basic concepts of Text formatting and Latex file	Understand (Level K2)
CO2	Demonstrating command names and arguments, Special characters.	Apply (Level K3)
CO3	Apply the commands to create document layout and displayed output	Apply (Level K3) & Create (Level K6)
CO4	Create Table, Printing Text, Foot notes and marginal notes	Create (Level K6)
CO5	Apply Latex commands to mathematical formulae	Apply (Level K3)
Functional Analysis		
CO1	Familiarize with the concepts of normed linear spaces and operators on normed linear space	Remember(Level K1)
CO2	Demonstrate an understanding of the concepts of Hilbert spaces and Banach spaces, and their role in mathematics	Understand (Level K2)
CO3	Apply the theorems.	Apply (Level K3)
CO4	Obtain Orthogonal complements, Orthonormal sets and conjugate space.	Analyze (Level K4)
CO5	Understand the concepts of linear operators, self adjoint, unitary operators , isometric isomorphism on Hilbert spaces ,Determinants ,the spectrum of an operator, Banach algebra.	Understand (Level K2)
Differential Geometry		
CO1	Define and understand basic definitions of the theory of curves.	Remember(Level K1)
CO2	Interpret the notions of surface of revolution and direction coefficients.	Understand (Level K2)
CO3	Analyze the elements of Analytic representation.	Analyze (Level K4)
CO4	Acquire knowledge on first fundamental form and second fundamental form.	Analyze (Level K4)
CO5	Explain Meusnier's theorem and Euler's Theorem on elementary theory of surface.	Apply (Level K3)
Project		
CO1	Applying the relative notions in the respective areas and finding the results	Apply (Level K3)
CO2	Analyzing results with the existing results.	Analyze (Level K4)
CO4	Acquire knowledge in their area of interest.	Understand (Level K2)
CO5	Promote techniques of research	Evaluate (Level K5)
Elective-VI: Mathematical Python-Theory and Practical		
CO1	Remembering the concept of operators, data types, Loops and control statements in Python programming.	Remember(Level K1)
CO2	Understanding the concepts of Input / Output operations in file.	Understand (Level K2)
CO3	Applying the concept of functions and exception handling	Apply (Level K3)
CO4	Analyzing the structures of list, tuples and maintaining dictionaries.	Analyze (Level K4)
CO5	Applying the concept of User defined exceptions	Apply (Level K3)

Elective-VI: Financial Mathematics		
CO1	To understand the basic concepts of Financial Mathematics.	Understand (Level K2)
CO2	To understand and prove theorems.	Understand (Level K2) & Evaluate (Level K5)
CO3	To understand the method to solve the problems by applying principles and concepts of Financial Mathematics	Apply (Level K3) & Evaluate (Level K5)
Training for Competitive Examinations -Mathematics for NET / UGC –CSIR / SET / TRB Competitive Examinations and General Studies for UPSC/ TNPSC		
CO1	To understand the basic concepts of differential and graph theory.	Understand (Level K2)
CO2	To understand and prove theorems.	Understand (Level K2)
CO3	To understand the method to solve the problems by applying principles and concepts of complex, differential areas.	Apply (Level K3) & Evaluate (Level K5)
CO4	To understand the basic concepts of statistics	Understand (Level K2)
CO5	To understand and solve the probability problems.	Understand (Level K2) & Evaluate (Level K5)