PROGRAM SPECIFIC OUTCOMES, PROGRAM OUTCOME AND COURSE OUTCOMES	
PG DEPARTMENT OF MATHEMATICS **B.Sc., MATHEMATICS , M.Sc., MATHEMATICS ,EXTRA CREDIT & VALUE ADDED COURSES** **PSO, PO & CO STATEMENTS / 2022**	
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	
Description of POs	
PO 1	To develop important analytical skills and problem solving strategies to assess a broad range of issues in real life.
PO 2	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.
PO 3	To formulate and develop mathematical arguments in a logical manner.
PO 4	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
PO 5	To meet the global challenges and accomplish various rewarding positions in the society.

	B.Sc., MATHEMATICS / COURSE OUTCOMES	Bloom's Taxonomy/ Cognitive Domain
Description of COs		
AUMC1	**Calculus**	
CO1	Acquire knowledge in solving the double integrals on both Cartesian and polar co-ordinates.	Knowledge (level K1)

CO2	Understand the concepts of Beta and Gamma functions	Understand (level K2)
CO3	Understand the concepts of Radius of Curvature, Cartesian Form, p - r equations.	Understand (level K2)
CO4	Demonstrate the use of leibnitze formula finding the nth differential equations.	Application (Level K3)
CO5	Analyze the concept of differential equations and use various methods of finding the radius of curvature	Analyze(Level K4)
AUMC2	**Theory of Equations, Trigonometry and Fourier Series**	
CO1	Acquire knowledge of trigonometric functions, the nature of hyperbolic functions, Fourier Series and Vector point functions.	Knowledge (level K1)
CO2	Understand how to find the Fourier co-efficient for Periodic functions	Understand (level K2)
CO3	Apply the concepts of Roots multiplied by a given number Standard forms to increase and decrease the roots of given equation by a given quantity in Reciprocal equations.	Application (Level K3)
CO4	Analyze different methods like Descartes Method, Cardan's method, Ferrari's method in theory of equations	Analyze(level K4)
CO5	Analyze the relation between roots and coefficients of the polynomial equations	Analyze(Level K4)
AUMQA1	**Quantitative Aptitude-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	Analyze(Level K4)
AUMC3	**Analytical Geometry**	
CO1	Recollect the properties of circle, sphere and can able to gain a deep knowledge in it.	Knowledge (level K1)
CO2	Identify different forms of equations of plane	Knowledge (level K1)
CO3	Understand the relation between polar and rectangular Cartesian co-ordinates.	Understand (level K2)
CO4	Acquire the knowledge of coplanar lines, skew lines and its properties.	Application (Level K3)
CO5	Apply concept of a sphere and circle to determine their equations.	Analyze(Level K4)
AUMC4	**Vector Calculus and Infinite Series**	
CO1	Acquire the basic knowledge of convergence and divergence	Knowledge (level K1)

CO2	Apply the concept of skew lines in evaluating the shortest distance between them and apply the concepts of Gradient, Divergence and Curl in solving vector differentiation problems.	Understand (level K2)
CO3	Calculate line, surface, double and triple integrals and use Green's theorem in the plane, Gauss' divergence theorem and Stokes' theorem	Analyze(Level K4)
CO4	Apply various tests to find the limit of a series	Application (Level K3)
CO5	Analyze the behavior of convergence of series by using tests	Analyze(Level K4)
AUMQA2	**Quantitative Aptitude -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	Analyze(Level K4)
AUMC5	**Modern Algebra-I**	
CO1	Acquire the basic knowledge and the structure of Group, Subgroup and Cyclic Groups	Knowledge (level K1)
CO2	Describe the characteristics of a ring, quotient rings and Ideals	Understand (level K2)
CO3	Use appropriate techniques and reasoning to prove the properties of groups.	Understand (level K2)
CO4	Apply the concepts of homomorphism and isomorphism for groups and rings	Application (Level K3)
CO5	Analyze and demonstrate examples of subgroups, normal subgroups and quotient groups	Analyze(Level K4)
AUMC6	**Statics**	
CO1	Acquire the basic knowledge of Laws of friction and deploy them in solving the respective problems.	Knowledge (level K1)
CO2	Understand the concepts of forces and moments.	Understand (level K2)
CO3	Apply the concepts of forces in finding the resultant of more than one force acting on a surface.	Application (Level K3)
CO4	Understand the concept of friction	Understand (level K2)
CO5	Analyze the basics of coplanar forces and equilibrium of three forces acting on a rigid body and can solve the simple problems related to it.	Analyze(Level K4)
AUMA3	**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.	Understand (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.	Analyze(Level K4)
AUMN1	**Operations Research**	
CO1	Remember various techniques to solve real life problems	Knowledge (level K1)
CO2	Understand the basics in the field of game theory	Understand (level K2)
CO3	Analyze pure and mixed strategy games	Understand (level K2)
CO4	Find the replacement period of equipment that fails suddenly/gradually	Application (Level K3)
CO5	Obtain the optimal solution for Sequencing problem and Game Theory	Analyze(Level K4)
AUMQA3	**Quantitative Aptitude – III**	
CO1	Acquire the basic knowledge of area and volume	Knowledge (level K1)K1
CO2	Understand the basic concepts of Quantitative ability	Understand (level K2)
CO3	Understand the basic concepts of logical reasoning	Application (Level K3)
CO4	Apply the problems on train with solved examples	Analyze(Level K4)
CO2	Analyze the concepts of simple and compound interest in real life	Analyze(Level K4)
AUMC7	**Differential Equations and its Applications**	
CO1	Identify and obtain the solution of Clairaut's equation	Knowledge (level K1)
CO2	understand the basic knowledge of complimentary function , particular integral, Laplace Transform and its inverse and solving method of Partial differential equations.	Understand (level K2)
CO3	Apply Laplace Transforms to Solve ordinary differential equations with constant co-efficient and simultaneous linear equations	Understand (level K2)
CO4	Analyze the application of differential equations in the field of Science	Application (Level K3)
CO5	Create real life problems into ordinary differential equations.	Analyze(Level K4)
AUMC8	**Dynamics**	
CO1	Remember the notions which were studied under Simple harmonic motion and seconds pendulum	Knowledge (level K1)

CO2	Understand the concept of projectiles and its properties by solving some simple problems related to it..	Understand (level K2)
CO3	Understand the concept of enveloping parabola.	Application (Level K3)
CO4	Apply the Newtons law in their real life.	Analyze(Level K4)
CO5	Analyze the concept of impulse, impulsive forces and the collision of elastic bodies and able to solve the simple problems regarding it.	Analyze(Level K4)
AUMA4	**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.	Analyze(Level K4)
CO5	Analyze the association between two or more groups and populations.	Analyze(Level K4)
AUMQA4	**Quantitative Aptitude - IV**	
CO1	Remember the concepts of heights and distances	Knowledge (level K1)
CO2	Understand the concepts of odd man out & series.	Understand (level K2)
CO2	Understand the basic concepts of Quantitative ability	Understand (level K2)
CO3	Understand the basic concepts of logical reasoning	Understand (level K2)
CO4	Analyze the concepts of Banker's discount	Analyze(Level K4)
AUMC9	**Modern Analysis**	
CO1	Identify the relation between completeness and compactness sets in metric space.	Knowledge (level K1)
CO2	Classify the countable, uncountable, open, closed and compact sets.	Understand (level K2)
CO3	Apply the properties of real numbers.	Application (Level K3)
CO4	Analyze the nature of sets under limits and continuity.	Analyze(Level K4)
AUMC10	**Modern Algebra-II**	
CO1	Understand the basic ideas of vector spaces and the concepts of span, linear independence basis dimension and to apply these concepts to vector spaces and subspaces .	Knowledge (level K1)

CO2	Solve systems of linear equations and to reduce the augmented matrix and Compute the characteristic polynomial, eigen values and eigen vectors	Understand (level K2)
CO3	Compute inner products and determine orthogonality on vector spaces, including Gram-Schmidt orthogonalization.	Application (Level K3)
CO4	Apply the principles of matrix algebra to linear transformations	Analyze(Level K4)
CO5	Apply the linear transformations, rank, nullity.	Analyze(Level K4)
AUMTP11	**Programming in C**	
CO1	Understand the use of structured program development in C as applied to small programming projects.	Knowledge (level K1)
CO2	Understand the concepts and Programming	Understand (level K2)
CO3	Analyze the use of decision making statement and loop structures.	Understand (level K2)
CO4	Gain a high level understanding of the structure of 'C' functions.	Application (Level K3)
CO5	Acquire knowledge about arrays & pointers.	Analyze(Level K4)
AUME1	**Operations Research – I**	
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	Analyze(Level K4)
CO5	Analyze the concept of complementary slackness and its role in solving primal / dual problem.	Analyze(Level K4)
AUME1	**Theory of Numbers**	
CO1	Understand factual knowledge including the mathematical notation and terminology of number theory.	Knowledge (level K1)
CO2	Construct mathematical proofs of statement and find counter examples to false statements in Number Theory.	Understand (level K2)
CO3	Apply theoretical knowledge to problem of computer security	Application (Level K3)

CO4	Analyze the logic and methods behind the major proofs in number theory	Analyze(Level K4)
AUME2	**Numerical Methods**	
CO1	Acquire knowledge about the basic concepts of numerical algorithms using appropriate technology.	Knowledge (level K1)
CO2	Understand the numerical methods for approximating the solution of the problems of algebraic and transcendental equations, ordinary differential equations.	Understand (level K2)
CO3	Solve the ordinary differential equations by using the methods like Euler's, Runge Kutta, Modified Euler and Improved Euler.	Application (Level K3)
CO4	Apply various interpolation methods and finite different concepts	Application (Level K3)
CO5	Compare the viability of different approaches to the numerical solution of problems arising in roots of solution of non-linear equations, interpolation and approximation, numerical differentiation and integration, solution of linear systems.	Analyze(Level K4)
AUME2	**Discrete Mathematics**	
CO1	Acquire knowledge about the basic concepts of Discrete Mathematics and its applications.	Knowledge (level K1)
CO2	Understand abstract algebra, posets, lattices, Boolean algebra and their applications in the field of engineering and computer science.	Understand (level K2)
CO3	Understand the concept of properties of lattices	Understand (level K2)
CO4	Apply logically valid forms of arguments to avoid logical errors by studying mathematical logic.	Application (Level K3)
CO5	Analyze the concepts of mathematical logic and relation.	Analyze(Level K4)
AUMNP5	**Practical- Numerical Problems using C- Programming**	
CO1	To write C programs to solve numerical, algebraic and transcendental equations	Knowledge (level K1)
CO2	To solve simultaneous linear equations using numerical methods.	Understand (level K2)
CO3	To write C programs for numerical Integration.	Understand (level K2)
CO4	To write C programs to Solve Ordinary Differential Equations numerically and Interpolation.	Application (Level K3)
CO5	To rectify the errors in 'C' Programming.	Analyze(Level K4)

AUMC12	Complex Analysis	
CO1	Identify the isolated singularities of a function and determine whether they are removable, poles, or essential.	Knowledge (level K1)
CO2	Understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations.	Understand (level K2)
CO3	Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra.	Application (Level K3)
CO4	Find residues and evaluate complex integrals using the residue theorem.	Application (Level K3)
CO5	Analyze functions as Taylor, power and Laurent series, classify singularities and poles.	Analyze(Level K4)
AUMC13	Graph Theory	
CO1	Identify vertices, edges and paths with specific properties such as cut vertices, bridges, Eulerian, etc	Knowledge (level K1)
CO2	Remember and understand the theoretical knowledge of graph theory to solve problems.	Understand (level K2)
CO3	Understand the Concept of Eulerian graphs , Hamiltonian graphs and Planar graph.	Understand (level K2)
CO4	Identify trees and their properties.	Application (Level K3)
CO5	Illustrate the fundamental applications of Graph Theory in different walks of life	Analyze(Level K4)
AUMTP14	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.	Analyze(Level K4)
AUME3	Operations Research-II	
CO1	Remember various techniques to solve real life problems	Knowledge (level K1)
CO2	Understand the theory of games for solving simple games..	Understand (level K2)
CO3	Apply the fundamental concept of inventory control and some of the Queuing models.	Application (Level K3)

CO4	Analyze distinction between PERT & CPM	Analyze(Level K4)
AUME3	**Astronomy**	
CO1	Identify the basic knowledge of the Moon.	Knowledge (level K1)
CO2	Understand the concept of solar and lunar ellipses.	Understand (level K2)
CO3	Apply the concept of Kepler's laws of planetary motion	Application (Level K3)
CO4	Analyze the variation in duration of day and night in various zones of earth.	Analyze(Level K4)
CO5	Categorize various means in solving Time	Analyze(Level K4)
AUMN2	**Numerical Methods**	
CO1	Understand the fundamentals in finding the roots of the equation using bisection method and iteration method.	Knowledge (level K1)
CO2	Approximate solutions of algebraic and transcendental equations.	Understand (level K2)
CO3	Analyze and evaluate the accuracy of numerical methods	Application (Level K3)
CO4	Evaluate numerical solution to a system of linear equation by Gauss-Seidal method.	Application (Level K3)
CO5	Evaluate the problems in interpolation.	Analyze(Level K4)
AUMA1	**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.	Analyze(Level K4)
AUMA2	**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	Analyze(Level K4)
EXTRA CREDIT COURSES		
UGEMC	**Mathematical Aptitude for Competitive Examinations**	
CO1	Memorize the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern.	Knowledge (level K1)
CO2	Classify the Coding Direction Sense Test, Mathematical Operations, Inserting the Missing Character, Verification of Truth of the Statement.	Understand (level K2)
CO3	Examine the Decoding ,Blood Relations, Inserting the Missing Character.	Application (Level K3)
CO4	Apply the concepts of permutations and combinations.	Application (Level K3)
CO5	Analyze the concepts of problems on Banker's Discount	Analyze(Level K4)
UGESS	**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	Understand (level K2)
CO4	Analyze the different kinds of Eclipses	Analyze(Level K4)
CO5	Analyze the concept of Zodiacal Constellation	Analyze(Level K4)
UGEST	**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	Analyze(Level K4)
CO4	Apply the concept of conjunction – disjunction	Application (Level K3)
CO5	Analyze the concept of logically true and logically Equivalent statement	Analyze(Level K4)
VALUE- ADDED COURSES		
Vedic Mathematics		
CO1	Understand the concept of High Speed Multiplication and Faster Division	Knowledge (level K1)
CO2	Apply the speed method to calculate the Square Roots, Cube Roots and Digital Roots	Evaluation (Level K5)
CO3	Solve Maths problems faster and more efficient	Knowledge (Level K1)

CO4	Sharpen mind, increases mental agility and intelligence	Application (Level K3)
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.
Description of POs	
Program Outcomes (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	
APMC1	**Abstract Algebra**	
CO1	Understand Sylows theorem and its applications	Application (Level K3)
CO2	Formulate some special types of rings and their properties.	Evaluate(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)
APMC2	**Real Analysis**	
CO1	Apply the Riemann Stieltjes integral and bring its properties and rectifiable curves.	Application (Level K3)
CO2	Remembering of sequences and series along with its properties	Knowledge(Level KI)
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	Synthesis(Level K5)
APMC3	**Ordinary Differential Equations**	
CO1	Recall the types of linear homogeneous equations of second order equations with constant coefficients and apply the method to solve.	Knowledge(Level KI)
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.	Application (Level K3)
CO4	Comprehend the Euler equations, the Bessel's equation and Regular, Singular points at infinity and to evaluate.	Synthesis(Level K5)
CO5	Identify the research problem where differential equation can be used to model the problem.	Evaluate(Level K6)
APMC4	**Computer Oriented Numerical Methods**	
CO1	Solve problems in numerical differentiation and integration	Application (Level K3)
CO2	Solve system of equations using various methods.	Application (Level K3)
CO3	Apply various methods to find numerical solution of first and second order ordinary differential equations.	Application (Level K3)
CO4	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)
APME1	**Graph Theory**	
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)
CO4	Apply Chromatic Number	Application (Level K3)
CO5	Determining the planar, non-planar, and directed graphs	Application (Level K3)
APME1	**Neural Networks**	
CO1	Understand and analyze different neutron 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)
CO4	Study convergence and generalization and implement common learning algorithm,	Evaluate(Level K6)

CO5	Study directional derivatives and necessary conditions for optimality and to evaluate quadratic functions.	Synthesis(Level K5)
APMC5	**Linear Algebra**	
CO1	Understand the basic concepts of Linear transformations, characteristic roots and matrices of linear transformation and its applications.	Application (Level K3)
CO2	Explain about the algebra of polynomials, polynomial ideals and prime factorization of a polynomial.	Analyze (Level K4)
CO3	Understand the basic concepts of determinants and its additional properties.	Application (Level K3)
CO4	Recognize the concepts of Invariant subspaces and diagonalization process.	Understand (level K2)
CO5	Analyze canonical Form, Jordan Form and Rational canonical Form.	Analyze (Level K4)
APMC6	**Complex Analysis**	
CO1	Remembering the concept of Analytic function and as a mapping on the plane.	Knowledge(Level KI)
CO2	Understand Cauchy's Integral Formula on open sets on the plane and know about poles , residues and singularities.	Analyze (Level K4)
CO3	Apply the Cauchy's integral formula in residue theorems and in evaluation of definite integrals.	Analyze (Level K4)
CO4	Analyze and represent the sum function of a power series as an Analytic Function.	Synthesis(Level K5)
CO5	Study and Understand periodic function, Weierstrass$\wp$ function and its applications.	Evaluate(Level K6)
APMC7	**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.	Synthesis(Level K5)
CO4	Apply variable separable method to solve Laplace and Diffusion equation	Application (Level K3)
CO5	Finding the appropriate method to solve the partial differential equations	Evaluate(Level K6)
APMC8	**Optimization Techniques**	

CO1	Explain various techniques to solve real life problems expressed in terms of LPP.	Understand (level K2)
CO2	Solving LPP through Dynamic Programming	Application (Level K3)
CO3	Apply the fundamental concept of Inventory control.	Application (Level K3)
CO4	Understanding the queuing theory	Understand (level K2)
CO5	Solving NLPP using Kuhn–Tucker Method	Application (Level K3)
APME2	**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	Knowledge(Level KI)
CO2	Analyze and apply the knowledge of fuzzy relations.	Analyze (Level K4)
CO3	Develop the basic concepts of fuzzy measures.	Evaluate(Level K6)
CO4	Explore the concept of uncertainty. .	Evaluate(Level K6)
CO5	Understand the types of uncertainty measures and principles	Application (Level K3)
APME2	**Magnetohydrodynamics**	
CO1	Understand the basic concepts of Electromagnetism, Fundamental Laws and fluid motion in magnetic field.	Understand (level K2)
CO2	Solve and analyze the Naiver-Stokes equations and velocity Magneto fluid dynamic equations with examples.	Application (Level K3)
CO3	Understand the MHD approximation and gain ability to analyze Magnetic Reynolds number.	Analyze (Level K4)
CO4	Gain knowledge about the Magneto hydrostatics and Alfven waves in incompressible MHD.	Synthesis(Level K5)
CO5	Understand and develop the Hartmann Flow in the presence of magnetic field.	Evaluate(Level K6)
APMC9	**Topology**	
CO1	Acquire knowledge about various types of topological spaces and their properties	Knowledge(Level KI)
CO2	Discuss connected spaces, the components of a space	Understand (level K2)
CO3	Apply the properties and derive the proofs of theorems.	Application (Level K3)
CO4	Construct a variety of examples and counter examples in topology	Application (Level K3)

CO5	Understand the properties of the compact spaces and analyse the different types of compactness.	Analyze (Level K4)
APMC10	**Fluid Dynamics**	
CO1	Recall the basic concepts of velocity, density and curvilinear co-ordinates.	Knowledge(Level KI)
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.	Analyze (Level K4)
CO4	Analyze the approximate solutions of the Navier – Stokes equation.	Synthesis(Level K5)
CO5	Analyze and apply the appropriate method to solve integral equation of boundary layer, Blasius equation and its series solution.	Analyze (Level K4)
APMC11	**Differential Geometry**	
CO1	Define and understand basic definitions of the theory of curves.	Knowledge(Level KI)
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.	Analyze (Level K4)
APMC12	**Programming in Python**	
CO1	Remembering the concept of operators, data types, Loops and control statements in Python programming.	Knowledge(Level KI)
CO2	Understanding the concepts of Input / Output operations in file.	Understand (level K2)
CO3	Applying the concept of functions and exception handling	Analyze (Level K4)
CO4	Analyzing the structures of list, tuples and maintaining dictionaries.	Analyze (Level K4)
CO5	Applying the concept of User defined exceptions	Application (Level K3)
APMP1	**Programming in Python - Practical**	
CO1	Understand the concept of Python programming	
CO2	Utilizing Python program for finding the Numerical solutions of Algebraic and Transcendental Equations.	Application (Level K3)
CO3	Analyzing the GCD, interpolation values and File management using Python programs	Analyze (Level K4)

CO4	implement basic operators and function concepts.	Synthesis(Level K5)
CO5	Applying, compiling and debugging programs with the help of Python	Evaluate(Level K6)
APMCE3	**Mathematical Statistics**	
CO1	Remembering the understanding the basic concepts such as statistics, probability and random variables.	Knowledge(Level KI)
CO2	Applying the concepts and methods to find the moments of the distributions.	Application (Level K3)
CO3	Study multivariate distributions and the independence of random variables. Further evaluating the marginal distributions from bivariate distributions.	Synthesis(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.	Analyze (Level K4)
APMCE3	**Number Theory**	
CO1	Find quotients and remainders and greatest common divisors applying Euclidean Algorithm	
CO2	Understand the definitions of congruence, residue classes and least residues	Understand (level K2)
CO3	Analyze the concept of Prime Power Moduli and Quadratic Residues	Analyze (Level K4)
CO4	Determine multiplicative inverses, modulo n and use to solve linear congruence.	Application (Level K3)
CO5	Acquire knowledge on Linear Diaphantine equation	Analyze (Level K4)
APMC13	**Functional Analysis**	
CO1	Familiarize with the concepts of normed linear spaces and operators on normed linear space	Knowledge(Level KI)
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.	Application (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)
APMC14	**Measure Theory**	
CO1	Understanding the basic concepts of the definition of general Lebesque integral.	Understand (level K2)
CO2	Derives the concepts of Borel sets, measurable functions, differentiation of monotone functions	Knowledge(Level KI)

CO3	Demonstrate statement of main results in fundamental integral theorems, monotone convergence theorem, and its related proves and results.	Synthesis(Level K5)
CO4	Demonstrate the proof in integration in product spaces and signed measures.	Understand (level K2)
CO5	Apply the theory of this course to solve real problems in difficult situations.	Synthesis(Level K5)
APME4	**Elements of Stochastic Processes**	
CO1	Acquire adequate knowledge about Continuous Time Markov Chain and Queueing Systems.	Knowledge (Level K1)
CO2	Gain understanding on the Renewal Process, Cumulative Process and Semi- Markov Process.	Application (Level K3)
CO3	Apply different methods and solve Birth and Death queues.	Application (Level K3)
CO4	Examine the computations of M/G/1 and G/M/1 Queues and Network of Queues.	Analyze (Level K4)
CO5	Conclude the idea of Brownian Motion and First Passage Times.	Synthesis(Level K5)
APME4	**Control Theory**	
CO1	Explain observability and estimate the observability of constant coefficient system, linear, nonlinear system, and discuss reconstruction kernel.	Understand (level K2)
CO2	Apply controllability criteria to constant coefficient system, linear, nonlinear system, and explain steering function.	Application (Level K3)
CO3	Analyze the stability of linear system, linear time varying system, perturbed linear system and nonlinear system.	Analyze (Level K4)
CO4	Evaluate stabilizabilization via linear feedback control, Bass method.	Synthesis(Level K5)
CO5	Analyze controllable subspace, and stabilization with restricted feedback.	Analyze (Level K4)
APMPR	**Project**	
CO1	Applying the relative notions in the respective areas and finding the results	Analyze (Level K4)
CO2	Analyzing results with the existing results.	Synthesis(Level K5)
CO3	Interpreting the results with suitable examples.	Analyze (Level K4)
CO4	Acquire knowledge in their area of interest.	Understand (level K2)
CO5	Promote techniques of research	Synthesis(Level K5)