

**PROGRAMME SPECIFIC OUTCOMES, PROGRAMME OUTCOME AND COURSE OUTCOMES**

**DEPARTMENT OF MATHEMATICS**

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

**PSO, PO & CO STATEMENTS / 2019 - 2022**

**PROGRAMME SPECIFIC OUTCOMES**

PSO1	Acquiring a strong foundation in various branches of mathematics to formulate real life problems into mathematical models.
PSO2	Enhancing numerical ability and address problems in interdisciplinary areas which would help in project and field works.
PSO3	Applying the mathematical knowledge and skills to face competitive examination with confidence.
PSO4	Pursuing higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.
PSO5	Developing entrepreneurial skills, become empowered and self dependent in society.
PSO6	Applying knowledge of principles, concepts and results in specific subject area to analyze their local and global impact.
PSO7	Communicating appropriately and effectively, in a scientific context using present technology and new findings.

**B.Sc., MATHEMATICS / PROGRAMMES OUTCOMES**

<b>POs</b>	<b>Description of POs</b>
PO1	Applying the acquired scientific knowledge to face day to day needs
PO2	Creating innovative ideas through laboratory experiments.
PO3	Carrying out field works and projects independently and in collaboration with other institutions and industries.
PO4	Knowing the basic subject knowledge required for higher studies, professional and applied courses like Management Studies, Law etc.
PO5	Challenging competitive examinations that offer rewarding careers in science and education.
PO6	Imparting communicative skills and ethical values.
PO7.	Equipping students with hands on training through various courses to enhance entrepreneurship skills



CO4	Revising the properties of eigen values of the matrices	Evaluation (Level K5)
CO5	Practicing the expansion of Fourier series and utilize the same for higher studies	Application (Level K3)
<b>MUMMC1 Mathematics for Competitive Examinations-I</b>		
CO1	Reviewing the rules of operations on numbers	Comprehension (Level K2)
CO2	Remembering the meaning of HCF and LCM of numbers.	Knowledge (Level K1)
CO3	Understanding the concepts of odd man out & series.	Comprehension (Level K2)
CO4	Applying the concepts of profit & loss in real life problems..	Application (Level K3)
CO5	Analyzing the concepts of ratio & proportion	Analysis (Level K4)
<b>MUMC3 Analytical Geometry and Vector Calculus</b>		
CO1	Explaining the physical meaning and properties of curl and divergence	Comprehension (Level K2)
CO2	Recollecting the properties of circle, sphere and can able to gain a deep knowledge in it.	Knowledge (Level K1)
CO3	Understanding the relation between polar and rectangular Cartesian co-ordinates.	Comprehension (Level K2)
CO4	Applying 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.	Application (Level K3)
CO5	Calculating line, surface, double and triple integrals and use Green's theorem in the plane, Gauss' divergence theorem and Stokes' theorem	Analysis (Level K4)
<b>MUMC4 Sequences and Series</b>		
CO1	Explaining the primary concepts of sequences and series of real numbers	Comprehension (Level K2)
CO2	Acquiring the basic knowledge of convergence and divergence	Knowledge (Level K1)
CO3	Understanding the behaviour of monotonic sequences	Comprehension (Level K2)
CO4	Applying the definitions of convergence as they apply to sequences and series	Application (Level K3)
CO5	Analyzing the behaviour of convergence of series by using tests	Analysis (Level K4)
<b>MUMA2 Allied Mathematics – II / (For B.Sc., Physics &amp; Chemistry) Integral Calculus, Differential Equations, Laplace Transforms &amp; Vector Analysis)</b>		
CO1	Explaining the physical meaning and properties of curl and divergence	Comprehension (Level K2)

CO2	Practicing the computation of line integrals, surface Integrals	Knowledge (Level K1)
CO3	Using computational tools to solve problems and applications of partial differential equations of first order.	Comprehension (Level K2)
CO4	Finding the complementary function and particular integral of a differential equation by using appropriate methods	Application (Level K3)
CO5	Using Laplace transform and their inverse to solve differential equations	Analysis (Level K4)
<b>MUMTN2 Theory of Numbers</b>		
CO1	Acquiring the basic knowledge of divisibility, congruence, greatest common divisor, prime and prime- factorization.	Comprehension (Level K2)
CO2	Exploring various techniques to congruencies of various types.	Knowledge (Level K1)
CO3	Applying the concept of Euler's function , Fermat's theorem and Wilson's theorem.	Comprehension (Level K2)
CO4	Evaluating the Product of r consecutive integers is divisible by r!	Application (Level K3)
CO5	Expressing the concepts and results of divisibility of Integers effectively	Analysis (Level K4)
<b>MUMC5 Modern Algebra</b>		
CO1	Acquiring the basic knowledge and the structure of Group, Subgroup and Cyclic Groups	Comprehension (Level K2)
CO2	Describing the characteristics of a ring, quotient rings and Ideals	Knowledge (Level K1)
CO3	Applying the concepts of homomorphism and isomorphism for groups and rings	Comprehension (Level K2)
CO4	Analyzing and demonstrate examples of subgroups, normal subgroups and quotient groups	Application (Level K3)
CO5	Developing proofs of results on Permutation groups, Cyclic groups, Quotient group, Subgroups, subrings, quotient rings	Analysis (Level K4)
<b>MUMC6 Statics</b>		
CO1	Calculating the reactions necessary to ensure static equilibrium	Comprehension (Level K2)
CO2	Acquiring the basic knowledge of Laws of friction and deploy them in solving the respective problems.	Knowledge (Level K1)
CO3	Understanding the concepts of forces and moments	Comprehension (Level K2)
CO4	Applying the concepts of forces in finding the resultant of more than one force acting on a surface.	Application (Level K3)

CO5	Analyzing the basics of coplanar forces and equilibrium of three forces acting on a rigid body and can solve the simple problems related to it.	Analysis (Level K4)
<b>MUMA3</b> <b>Statistics – I</b>		
CO1	Understanding that correlation coefficient is independent of the change of origin and scale	Comprehension (Level K2)
CO2	Acquiring the knowledge by using Binomial distribution, Poisson distribution etc..	Knowledge (Level K1)
CO3	Understanding random variables and probability distributions.	Comprehension (Level K2)
CO4	Using the different methods of finding the correlation coefficient.	Application (Level K3)
CO5	Computing expected value and variance of discrete and continuous random variables.	Analysis (Level K4)
<b>MUMN1</b> <b>Quantitative Aptitude – I</b>		
CO1	Learning ratio and proportion and practice duplication and triplication of ratios	Comprehension (Level K2)
CO2	Remembering the meaning of HCF and LCM of numbers.	Knowledge (Level K1)
CO3	Understanding the concepts of odd man out & series.	Comprehension (Level K2)
CO4	Applying the concepts of profit & loss in real life problems	Application (Level K3)
CO5	Analyzing the concepts of ratio & proportion	Analysis (Level K4)
<b>MUMMC3</b> <b>Mathematics for Competitive Examinations – II</b>		
CO1	Reviewing the rules of operations on numbers	Comprehension (Level K2)
CO2	Remembering the meaning of BODMAS rule.	Knowledge (Level K1)
CO3	Understanding the concept of percentage on simple problems	Comprehension (Level K2)
CO4	Applying the concept of time and work on real life problems	Application (Level K3)
CO5	Analyzing the problem on trains with solved examples..	Analysis (Level K4)
<b>MUMC7</b> <b>Differential Equations and Its Applications</b>		
CO1	Learning methods of forming and solving partial differential equations	Analysis (Level K4)
CO2	Identifying and obtain the solution of Clairaut's Equation	Comprehension (Level K2)
CO3	Understanding the basic knowledge of complimentary function , particular integral, Laplace Transform and its inverse and solving method of Partial differential equations	Knowledge (Level K1)

CO4	Applying Laplace Transforms to Solve ordinary differential equations with constant coefficient and simultaneous linear equations	Comprehension (Level K2)
CO5	Analyzing the application of differential equations the field of Science	Application (Level K3)
<b>MUMC Dynamics</b>		
CO1	Understanding the general principles of dynamics	Comprehension (Level K2)
CO2	Remembering the notions which were studied under simple harmonic motion and seconds pendulum	Knowledge (Level K1)
CO3	Understanding the concept of projectiles and its properties by solving some simple problems related to it	Comprehension (Level K2)
CO4	Applying the Newtons law in their real life	Application (Level K3)
CO5	Analyzing the concept of impulse, impulsive forces and the collision of elastic bodies and able to solve the simple problems regarding it.	Analysis (Level K4)
<b>MUMA4 Statistics - II</b>		
CO1	Acquiring knowledge of continuous random variables and testing hypothesis	Comprehension (Level K2)
CO2	Understanding the concepts of t, F, z-distributions and its applications and acquire the knowledge by using Normal distribution.	Knowledge (Level K1)
CO3	Demonstrating the use of chi-square distribution	Comprehension (Level K2)
CO4	Analyzing the concepts of sampling techniques and procedure for testing of hypothesis for large samples	Application (Level K3)
CO5	Analyzing the practical purposes of a large and a small sample	Analysis (Level K4)
<b>MUMSS4 Solar System and Stellar Universe</b>		
CO1	Understanding the concepts of Stellar Universe	Comprehension (Level K2)
CO2	Acquiring the knowledge of Sun and Planets	Knowledge (Level K1)
CO3	Understanding the concept of the Solar System	Comprehension (Level K2)
CO4	Demonstrating the different kinds of Eclipses	Application (Level K3)
CO5	Analyzing the various constellations	Analysis (Level K4)

<b>MUMC9</b>		
<b>Real Analysis</b>		
CO1	Understand the concepts of completeness, continuity and discontinuity of metric spaces	Comprehension (Level K2)
CO2	Identifying the relation between completeness and compactness sets in metric space.	Knowledge (Level K1)
CO3	Classifying the countable, uncountable, open, closed and compact sets.	Comprehension (Level K2)
CO4	Applying the properties of real numbers.	Application (Level K3)
CO5	Analyzing the nature of sets under limits and continuity.	Analysis (Level K4)
<b>MUMC10</b>		
<b>Linear Algebra</b>		
CO1	Recalling the definitions of Groups ,Fields and their properties	Comprehension (Level K2)
CO2	Understanding 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)
CO3	Solving systems of linear equations and to reduce the augmented matrix and Compute the characteristic polynomial, eigenvalues and eigenvectors	Comprehension (Level K2)
CO4	Computing inner products and determine orthogonality on vector spaces, including Gram-Schmidt orthogonalization.	Application (Level K3)
CO5	Applying the principles of matrix algebra to linear transformations	Analysis (Level K4)
<b>MUMCP11</b>		
<b>Programming in C</b>		
CO1	Understand the use of structured program development in C as applied to small programming projects.	Comprehension (Level K2)
CO2	Analyze the use of decision making statement and loop structures	Knowledge (Level K1)
CO3	Gaining a high level understanding of the structure of C functions	Comprehension (Level K2)
CO4	Acquiring knowledge about arrays & pointers	Application (Level K3)
CO5	Implementing an achievable practical applications and Analyze	Analysis (Level K4)
<b>MUME1</b>		
<b>Operations Research – I</b>		
CO1	Understanding the origin and development of Operations Research	Comprehension (Level K2)
CO2	Acquiring the knowledge of Transportation and Assignment problems	Knowledge (Level K1)
CO3	Understanding duality theorems and dual simplex method.	Comprehension (Level K2)
CO4	Using the Simplex Method or the Big M Method to solve linear programming problems	Application (Level K3)

CO5	Analyzing the concept of complementary slackness and its role in solving primal / dual problem.	Analysis (Level K4)
<b>MUME1 Combinatorics</b>		
CO1	Understanding the principles of Inclusion and Exclusion	Comprehension (Level K2)
CO2	Acquiring knowledge in Recurrence Relations	Knowledge (Level K1)
CO3	Understanding the ideas of permutations and combinations	Comprehension (Level K2)
CO4	Applying combinatorial ideas to practical problems	Application (Level K3)
CO5	Identifying knowledge about the Generalization of the pigeonhole principle	Analysis (Level K4)
<b>MUME2 Numerical Methods</b>		
CO1	Understanding the basic definitions and meaning of interpolation	Comprehension (Level K2)
CO2	Acquiring knowledge about the basic concepts of numerical algorithms using appropriate technology	Knowledge (Level K1)
CO3	Understanding the numerical methods for approximating the solution of the problems of algebraic and transcendental equations, ordinary differential equations	Comprehension (Level K2)
CO4	Solving the ordinary differential equations by using the methods like Euler's, Runge Kutta, Modified Euler and Improved Euler.	Application (Level K3)
CO5	Comparing 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	Analysis (Level K4)
<b>MUME2 Discrete Mathematics</b>		
CO1	Discussing the primary concepts of Lattices	Comprehension (Level K2)
CO2	Acquiring knowledge about the basic concepts of Discrete Mathematics and its applications	Knowledge (Level K1)
CO3	Understanding abstract algebra, posets, lattices, Boolean algebra and their applications in the field of engineering and computer science	Comprehension (Level K2)
CO4	Applying logically valid forms of arguments to avoid logical errors by studying mathematical logic	Application (Level K3)
CO5	Analyzing the concepts of mathematical logic and relation	Analysis (Level K4)



<b>MUMNU5 Numerical Problems using C- Programming- Practical</b>		
CO1	writing C programs to solve numerical, algebraic and transcendental equations and to solve simultaneous linear equations using numerical methods	Comprehension (Level K2)
CO2	Designing and implementing programs using C	Knowledge (Level K1)
CO3	Learning to rectify the errors in 'C' Programming	Comprehension (Level K2)
CO4	Solving Ordinary Differential Equations numerically and Interpolation	Application (Level K3)
CO5	Creating application using C programming language	Analysis (Level K4)
<b>MUMC12 Complex Analysis</b>		
CO1	Understanding the geometric representation of complex Numbers	Comprehension (Level K2)
CO2	Identifying the isolated singularities of a function and determine whether they are removable, poles, or essential	Knowledge (Level K1)
CO3	Understanding the significance of differentiability for complex functions and be familiar with the Cauchy- Riemann equations	Comprehension (Level K2)
CO4	Applying 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)
CO5	Analyzing functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem	Analysis (Level K4)
<b>MUMC13 Graph Theory</b>		
CO1	Understanding the basic definitions to write the proofs of simple theorems	Comprehension (Level K2)
CO2	Identifying vertices, edges and paths with specific properties such as cut vertices, bridges, Eulerian, etc	Knowledge (Level K1)
CO3	Understanding the Concept of Eulerian graphs, Hamiltonian graphs and Planar graph	Comprehension (Level K2)
CO4	Relating real life situations with mathematical graphs	Application (Level K3)
CO5	Developing the ability to solve problems in graph theory	Analysis (Level K4)
<b>MUMC14 Object Oriented Programming With C++</b>		
CO1	Explaining object oriented concepts and describe how they are supported by C++	Comprehension (Level K2)

CO2	Identifying the concept of classes and objects	Knowledge (Level K1)
CO3	Understanding the practice of object oriented programming in the construction of robust maintainable programs which satisfy the requirements	Comprehension (Level K2)
CO4	Applying C++ programming and program development within an integrated development environment	Application (Level K3)
CO5	Analyzing the use of operator overloading and type conversions	Analysis (Level K4)
<b>MUME3 Operations Research-II</b>		
CO1	Understanding the concept of Replacement problems	Comprehension (Level K2)
CO2	Remembering various techniques to solve real life problems	Knowledge (Level K1)
CO3	Understanding the theory of games for solving simple games	Comprehension (Level K2)
CO4	Applying the fundamental concept of inventory control and some of the Queuing models	Application (Level K3)
CO5	Analyzing distinction between PERT & CPM	Analysis (Level K4)
<b>MUME3 Astronomy</b>		
CO1	Defining the spherical trigonometry of the celestial sphere	Comprehension (Level K2)
CO2	Identifying the basic knowledge of the Moon	Knowledge (Level K1)
CO3	Understanding the concept of solar and lunar ellipses	Comprehension (Level K2)
CO4	Applying the concept of Kepler's laws of planetary motion	Application (Level K3)
CO5	Analyzing the variation in duration of day and night in various zones of earth	Analysis (Level K4)
<b>MUMPR Group Project</b>		
CO1	Choosing a new topic of their interest	Comprehension (Level K2)
CO2	Developing communication skills through oral presentation	Analysis (Level K4)
CO3	Expressing their views with confidence in a group	Comprehension (Level K2)
CO4	Relating with the group members and reap the best Harvest	Application (Level K3)
CO5	Developing the attitude of studying a topic in depth independently	Analysis (Level K4)
<b>MUMN2 Quantitative Aptitude – II</b>		
CO1	Using percentage concept to solve applied technical problems	Comprehension (Level K2)
CO2	Remembering the meaning of BODMAS rule	Analysis (Level K4)

CO3	Understanding the concept of percentage on simple problems.	Comprehension (Level K2)
CO4	Applying the concept of time and work on real life problems	Application (Level K3)
CO5	Analyzing the problem on trains with solved examples	Analysis (Level K4)
<b>EXTRA CREDIT COURSES</b>		
<b>UGEMCE Mathematical Aptitude for Competitive Examinations</b>		
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.	Analysis (Level K4)
CO4	Apply the concepts of permutations and combinations.	Application (Level K3)
CO5	Analyze the concepts of problems on Banker's Discount	Analysis (Level K4)
<b>UGEQA Quantitative Aptitude</b>		
CO1	Understand and analyze the partnership and ratio problems	Comprehension (Level K2)
CO2	Applying the concept of boats and streams problems	Analysis (Level K4)
CO3	Using area of four walls of room concepts and solve the problems	Comprehension (Level K2)
CO4	Applying the concept of volume and area of solid figure on real life problems	Application (Level K3)
CO5	Analyzing the problem on heights and distance	Analysis (Level K4)
<b>UGESTL Set Theory and Logic</b>		
CO1	Acquire the concept of Basic set operations	Knowledge (level K1)
CO2	Understand the concept of Equivalence relation	Comprehension (Level K2)
CO3	Analyse Tautology and Contradiction	Analysis (Level K4)
CO4	Apply the concept of conjunction – disjunction	Application (Level K3)
CO5	Analyze the concept of logically true and logically Equivalent statement	Analysis (Level K4)