MPMMSN TRUSTS COLLEGE SHORANUR
DEPARTMENT OF MATHEMATICS
PROGRAMME OUTCOME

Course Outcome : Complementary Mathematics for Bsc Physics and BSc Chemistry

Semester	Course Code	Course Name	Credit	Course outcome
I	**MAT1C01**	**MATHEMATICS**	**3**	➢ Limits and continuity of functions ➢ Derivatives and their applications ➢ Introduce Reimann integration of bounded function ➢ Applications of integrations ➢ Mean value theorems of differentiation and integrations
II	**MAT2C02**	**MATHEMATICS**	**3**	➢ learns the concept of hyperbolic functions. ➢ learns to find volume of solids of revolution, length of plane curves,areas of surface of revolution. ➢ Expand the information about sequences and series of real numbers. ➢ Understands the concepts of polar coordinates
III	**MAT3C03**	**MATHEMATICS**	**3**	➢ solve homogeneous second-order equations ➢ the mastery of theory of matrices requires well-developed skills, clear conceptual understanding. ➢ this paper familiarize the students about the theory and applications of matrices. ➢ This course equip the students to perform some basic vector operations ➢ Equip the students to apply concepts of limits, continuity, and derivatives to vector valued functions , Describe and determine velocity and acceleration of a vector-valued function and expand calculus to functions of several variables .

IV	**MAT4C04**	**MATHEMATICS**	**3**	➢ identify a general method for constructing solutions to inhomogeneous linear constantcoefficient second-order equations. ➢ equip the students to understand and apply the concept of Laplace transforms ➢ learns about Fourier series and partial differential equations. ⎫ ➢ Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems. ➢ Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

Course Outcome; Complementary mathematics for BA Economics

Semester	Course code	Course Name	Credit	Course outcome
I	**ECO1C04**	**MATHEMATICAL TOOLS FOR ECONOMICS I**	**2**	➢ It will open up the much needed mathematical rigour in understanding economic theory and empirical analysis ➢ Substantially contribute to improving the problem solving skills, numerical aptitude of students
II	**ECO2C04**	**MATHEMATICAL TOOLS FOR ECONOMICS II**	**2**	➢ Introduce the concept of set theory ➢ Operations of set theory and Venn diagrams ➢ Able to know relationship between linear equations and matrices ➢ Solving linear equation by matrix inversion and Crammers rule.
III	**ECO3C04**	**MATHEMATICAL TOOLS FOR ECONOMICS III**	**2**	➢ Introduce the concepts of functions and their limits and continuity. ➢ The first and second

				derivative test for optimizations ➢ Economic applications by using derivatives
IV	**ECO4C04**	**MATHEMATICAL TOOLS FOR ECONOMICS IV**	**2**	➢ Optimizations of multivariable functions using Lagrange function ➢ Use of integration in economics ➢ Calculations of definite and indefinite integrals.

Course Outcome; Msc Mathematics

Name of the Programme	**M.Sc Mathematics**
Programme Outcome	✓ Advanced concepts in mathematics of higher level; ✓ The ability to understand and comprehend mathematical literature of higher level independently; ✓ The ability to apply mathematical knowledge in a professional field (in teaching or in other fields); and ✓ The ability to formulate and communicate logically on problems involving mathematics; ✓ The ability to appreciate and advocate the beauty/power of higher mathematics in human culture and the modern society.
Programme Specific Outcomes	✓ Mathematical theory and applications in rigorous fashion; and further knowledge in recently developed topics of mathematics. ✓ Aquire knowledge in computational methods and data analytics ✓ Graduates can apply efficient methods to analyze the data in many different areas, for example, business, industry and scientific research.

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I	**MT1C01**	**ALGEBRA 1**	**4**	➢ Able to explain and correctly utilize vocabulary and significant theorems concerning groups and rings ➢ Understand plane isometries, Direct product & finitely generated Abelian groups, Factor group computations and simple groups, Group action on a set, applications of G-set to counting. ➢ Know about isomorphisms theorems, Series of Groups, Sylow theorems, Applications of the Sylow theory, Free groups. ➢ Understand the concept of Group Presentation, Rings of polynomial, Factorization of polynomials over a field, Non Commutative example, Homomorphism and factor rings
I	**MT1C02**	**LINEAR ALGEBRA**	**4**	➢ Know the vocabulary, notation and operations for vectors. ➢ Know the definitions of a vectorspace, sub space, bases and innerproduct and be able to provide examples of each. ➢ Be able to write basic mathematical. ➢ Be able to define linear transformations and find the domain, range, kernel, rank and nullity of a linear transformation. ➢ Be able to apply vectors, innerproduct and linear transformations to real world

				situations. ➢ Develop lesson plans that demonstrate their ability to explain concepts related to vectors
I	**MT1C03**	**REAL ANALYSIS 1**	**4**	➢ Understand the basic topology of real numbers ➢ Equip the students to understand the concept of differentiation ,continuity, L Hospital's rule,Taylor's theorem, differentiation of vector valued functions ➢ Able to explain the concept of Reimann-Stieltjes integral. ➢ Understand the concept of sequence and series of functions ➢ Know about the theorems related to the topic equicontinous families of functions and Stone – Weistrass theorem
I	**MT1C04**	**NUMBER THEORY**	**4**	➢ Understand about the topic arithmetical functions and Dirichlet multiplication,averages of arithmetical functions. ➢ Equip the students to understand some elementary theorems on the distribution of prime numbers. ➢ Able to explain the concept of quadratic residues and quadratic reciprocity law. ➢ Understand the concept of cryptography and public key.

I	**MT1C05**	**DISCRETE MATHEMATICS**	**4**	➢ Able to write precise and accurate mathematical definitions of objects in graph theory . ➢ Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples ➢ Validate and critically assess a mathematical proof; ➢ Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory ➢ Reason from definitions to construct mathematical proofs; ➢ Write about graph theory in a coherent and technically accurate manner. ➢ Understands the concept and theorems related to the topic Boolean algebra
II	**MT2C07**	**ALGEBRA II**	**4**	➢ Explain and correctly utilize vocabulary and significant theorems concerning feilds. ➢ Students will analyze, create, and present proofs of propositions regarding extention feilds. ➢ Apply appropriate theorems to determine properties of finite feilds ➢ Understand the concept of Galois theory.
II	**MT2C08**	**REAL ANALYSIS II**	**4**	➢ Understand the concepts and theotems related to the topics : Lebesgue outer measure, measurable sets, regularity, measurable functions, Borel and Lebesgue measurability,Integration of non-negative functions, the general integral, integration of series Reimann and Lebesgue integrals ➢ Able to know about differentiation, continuous non-differentiable functions, functions of bounded variation, Lebesgue's differentiation theorem, differentiation and integration, Lebegues set,

				Measures and outer measures, extension of a measure, uniqueness of the extension, completion of a measure, measure spaces, integration with respect to a measure ➢ Equip the students to understand the concept of Signed measures and the Hahn decomposition, Jordan decompositon, Radon–Nikodym theorem, some applications of Radon Nikodon Theorem, bounded linear functionals on Lp, Lebesgue stieltjes measure(omit proof of Theorem 4 and example 2), absolutely continuous functions, integration by parts, change of variable, Riesz Representation theorem
II	**MT2C09**	**TOPOLOGY**	**4**	➢ Able to understand the basic Concepts of topological spaces . ➢ Understand the topics making Functions Continuous, Quotient Spaces, Spaces with Special Properties ➢ Know about Separation Axioms: Hierarchy of Separation Axioms, Compactness and Separation Axioms, The Urysohn Characterization of Normality, Tietze Characterisation of Normality.
II	**MT2C10**	**ODE & CALCULUS OF VARIATIONS**	**4**	➢ Able to know Power Series Solutions and Special functions; Some Special Functions of Mathematical Physics ➢ Understand some special functions of Mathematical Physics , Systems of First Order Equations; Non linear Equations ➢ Know about oscillation theory of Boundary Value Problems, The Existence and Uniqueness of Solutions, The Calculus of Variations

II	**MT2C11**	**OPERATIONS RESEARCH**	**4**	➢ Able to know about convex functions and properties. ➢ Solving methods for linear programming problems ➢ Use of matrix transformation in simplex tableau ➢ Know about transportation problem in economic field ➢ Able to understand graph networks ➢ Knowledge about game theory applications
III	**MT3C12**	**MULTIVARIABLE CALCULUS & GEOMETRY**	**4**	➢ Understand the concept of functions of Several Variables – Linear Transformations, Differentiation, The Contraction Principle, The Inverse Function Theorem, the Implicit Function Theorem. ➢ Able to know about a curve, its arclength, reparametrization, Closed curves ,Level curves versus parametrized curves. Curvature, Plane curves, Space curves What is a surface, Smooth surfaces, Smooth maps, Tangents and derivatives, Normals and orientability. ➢ Understand applications of the inverse function theorem, Lengths of curves on surfaces, The second fundamental form, The Gauss and Weingarten maps, Normal and geodesic curvatures. Gaussian and mean curvatures, Principal curvatures of a surface.
III	**MT3C13**	**COMPLEX ANALYSIS**	**4**	➢ Apply and explain the fundamental theorems and concepts of introductory complex analysis. ➢ Differentiate and integrate complex functions and compare and contrast the relevant concepts as applied to real-valued versus complex-valued functions. ➢ Apply analytic and conformal mappings to real-life phenomena. ➢ Determine whether a given function is differentiable, and if so find its derivative,Express complex-differentiable

				functions as power series. ➢ Find parametrizations of curves, and compute complex line integrals directly
III	**MT3C14**	**FUNCTIONAL ANALYSIS**	**4**	➢ Able to facility with the main, big theorems of functional analysis. ➢ Be able to produce examples and counterexamples illustrating the mathematical concepts presented in the course. ➢ Understand the statements and proofs of important theorems and be able to explain the key steps in proofs, sometimes with variation. ➢ Able to know about metric spaces and continuous Functions, Lp spaces , Fourier series and Integrals, Normed spaces ,Continuity of linear maps Hahn-Banach Theorems ,Banach spaces ,Uniform Boundedness Principle , Closed Graph and Open Mapping Theorems , Bounded Inverse Theorem ➢ understand inner product spaces, Orthonormal sets.
III	**MT3C15**	**PDE&INTEGRAL EQUATIONS**	**4**	➢ Able to olve linear partial differential equations with Dirichlet, Neumann, and Robin boundary conditions in rectangular and non-rectangular coordinate systems using separation of variables and Fourier Series. ➢ Solve first order partial differential equations using the method of characteristics. ➢ Know and apply the basics of Sturm-Liouville theory. ➢ Understand and solve integral equations of different kind

III	**MT4C17**	**PROJECT**	**4**	➢ A planned undertaking such as a definitely formulated piece of research. ➢ a task or problem engaged in usually by a group of students to supplement and apply classroom studies Project help the students to: ➢ to reproduce on a surface by motion in a prescribed direction ➢ to display outwardly especially to an audience ➢ to attribute (one's own ideas, feelings or characteristics) to other people or to objects
IV	**MT4E02**	**ALGEBRAIC NUMBER THEORY**	**4**	➢ Able to know about Symmetric polynomials, Modules, Free abelian groups, Algebraic Numbers, Conjugates and Discriminants, Algebraic Integers, Integral Bases, Norms and Traces, Rings of Integers, Quadratic Fields, Cyclotomic Fields. ➢ Understand the Historical background, Trivial Factorizations, Factorization into Irreducibles, Examples of Nonunique Factorization into Irreducibles, Prime Factorization, Euclidean Domains, Eucidean Quadratic fields Ideals – Historical background, Prime Factorization of Ideals, The norm of an ideal ➢ Equip the students to understand the topics of Lattices, The Quotient Torus, Minkowski theorem, The Space Lst, The Class-Group An Existence Theorem, Finiteness of the Class-Group, Factorization of a Rational Prime, Fermat's Last Theorem – Some history, Elementary Considerations, Kummer's Lemma, Kummer's Theorem

IV	**MT4E07**	**ADVANCED FUNCTIONAL ANALYSIS**	**4**	➢ To know about dual and transpose of normed spaces ➢ Able to know three modes of convergence in functional spaces ➢ To understand about spectrum of operators like compact operator, normal operator, self adjoint operator and unitary operator. ➢ To know Numerical range of spectrum in different operator and their comparison
IV	**MT4E11**	**GRAPH THEORY**	**4**	➢ To develop the concepts graph theory, considered the topic Euler tours and Hamiltonian cycles. ➢ To know emerging trends in graph theory and promoting for research level, discussed major conjectors in colouring of graphs. ➢ To understand how to prove Brookes theorem, Vizing's theorem and five colour theorem for colourable grapghs ➢ Able to improve the idea of planarity and dual properties of graphs
IV	**MT4E14**	**DIFFERENTIAL GEOMETRY**	**4**	➢ Understand the concepts of Graphs and Level Set, Vector fields, The Tangent Space, Surfaces, Vector Fields on Surfaces, Orientation. The Gauss Map. ➢ Understand Curvature of Surfaces, Parametrized Surfaces, Local Equivalence of Surfaces and Parametrized Surfaces.
1	**MT1V06**	**VIVA VOCE**	**2**	➢ To improve the way of understanding basic concepts in all subjects

III	**MT3V16**	**VIVA VOCE**	**2**	➢ To improve the way of understanding basic concepts in all subjects