

Department of Mathematics
Nesamony Memorial Christian College, Marthandam
M. Sc. Mathematics
Course Outcome

Semester – I M. Sc. Mathematics					
Part	Course Name	Course Code	Credit	Hours	Course Outcome
Part - A	Core Course – I: Group Theory	VMAC11	5	6	Students will be able to CO1 Recall basic counting principle, characterization of normal subgroups, group homomorphism and application CO2 Define Solvable groups, automorphisms and Cayley’s Theorem. CO3 Explain Permutation Groups and Another Counting Principle. CO4 Explain Sylow’s theorems and apply the theorem to find number of Sylow subgroups CO5 Define direct products, examine the properties of finite abelian groups
	Core Course - II: Real Analysis	VMAC12	5	6	Students will be able to CO1 Analyze and evaluate functions of bounded variation and Rectifiable Curves. CO2 Describe the concept of Riemann-Stieltjes integral and its properties. CO3 Demonstrate the concept of step function, upper function, Lebesgue function and their integrals. CO4 Construct various mathematical proofs using the properties of Lebesgue integrals and establish the Levi monotone convergence theorem. CO5 Formulate the concept and properties of inner products, norms and measurable functions.
	Core Course - III: Ordinary Differential Equations	VMAC13	4	6	Students will be able to CO1 Establish the qualitative behaviour of solutions of systems of differential equations. CO2 Recognize the physical phenomena modelled by differential equations and dynamical systems. CO3 Analyze solutions using appropriate methods and give examples. CO4 Formulate Green’s function for boundary value problems. CO5 Understand and use various theoretical ideas and results that underlie the mathematics in this course.

	Elective - I: Graph Theory and Applications	VMAE11	3	6	Students will be able to CO1 Demonstrate the concept of different structures and types about graphs and explain its applications. CO2 Determine the properties of trees and applications in network and study the concepts of connections in graphs. CO3 Acquire the knowledge about Euler Tours, Hamilton Cycles and Matchings in Graphs. CO4 Analyze the concept of edge colouring, independent sets and cliques in Graphs CO5 Explain the concept of vertex colourings.
	Elective - II: Analytic Number Theory	VMAE15	3	6	Students will be able to CO1 Study the basic concepts of elementary number theory CO2 Explain several arithmetical functions and construct their relationships CO3 Apply algebraic structure in arithmetical functions CO4 Demonstrate various identities satisfied by arithmetical functions CO5 Determine the application to $\mu(n)$ & $\Lambda(n)$ and several equivalent form of prime number theorem
Semester – II M. Sc. Mathematics					
Part - A	Core Course – IV: Ring Theory and Lattices	VMAC21	5	6	Students will be able to CO1 Demonstrate competence with the basic ideas of algebra including the concepts of ideals and quotient Rings. CO2 Understand the concept of the Particular Euclidean ring. CO3 Able to demonstrate about the Polynomial rings over Commutative rings. CO4 Appreciate the significance Radicals CO5 Acquired the knowledge of direct sum of rings
	Core Course - V: Real Analysis - II	VMAC22	5	6	Students will be able to CO1 Understand measurable function and Lebesgue outer measure CO2 Explain Rieman and Lebesgue Integral. CO3 Understand and describe the basic concepts of Fourier series and Fourier integrals with respect to the orthogonal system. Analyze and evaluate the difference between transforms of various functions. CO4 Explain directional derivative, total derivative, matrix of linear function and sufficient condition for differentiability CO5 Explain implicit functions and Extremum problems with side conditions.
	Core Course - VI: Probability Theory	VMAC23	4	6	Students will be able to CO1 To define Random Events, Random Variables, to describe Probability, to apply Bayes, to define Distribution Function, to find Joint Distribution function, to find Marginal Distribution and

					<p>Conditional Distribution function, to solve functions on random variables.</p> <p>CO2 To define Expectation, Moments and Chebyshev Inequality, to solve Regression of the first and second types.</p> <p>CO3 To define Characteristic functions, to define distribution function, to find probability generating functions, to solve problems applying characteristic functions</p> <p>CO4 To define One point, two-point, Binomial distributions, to solve problems of Hypergeometric and Poisson distributions, to define Uniform, normal, gamma, Beta distributions, to solve problems on Cauchy and Laplace distributions</p> <p>CO5 To discuss Stochastic convergence, Bernoulli law of large numbers, to elaborate Convergence of sequence of distribution functions, to prove Levy-Cramer Theorems and de Moivre-Laplace Theorems, to explain Poisson, Chebyshev, Khintchine Weak law of large numbers, to explain and solve problems on Kolmogorov Inequality and Kolmogorov Strong Law of large numbers.</p>
	Elective - III: Research Methodology	VMAE21	3	5	<p>Students will be able to</p> <p>CO1 Discuss to know about writing style</p> <p>CO2 Discuss the Tips and Strategies</p> <p>CO3 To know about the research project</p> <p>CO4 Discuss the different components of Research Project</p> <p>CO5 To learn the Publication and presentation of research articles and Tool kits</p>
	Elective - IV: Operations Research	VMAE25	3	5	<p>Students will be able to</p> <p>CO1 Be able to build and solve Transportation and Assignment problems using appropriate method</p> <p>CO2 Learn the constructions of network and optimal scheduling using CPM and PERT</p> <p>CO3 Ability to construct linear integer programming models and solve linear integer programming models using branch and bound method</p> <p>CO4 Understand the need of inventory management.</p> <p>CO5 To understand basic characteristic features of a queuing system and acquire skills in analyzing queuing models</p>
	SEC - I: Mathematical Documentation using LaTeX	VMASE11	2	2	<p>Students will be able to</p> <p>CO1 To learn the latest techniques in Latex for the preparation of printable documents</p> <p>CO2 To avoid difficulty while typing a project or thesis comparing other mathematical software.</p> <p>CO3 To write mathematical equations and to draw graphs using Latex</p> <p>CO4 To fix footnotes and header</p> <p>CO5 To create tables and type formulae in Mathematics</p>

Semester – III M. Sc. Mathematics

Part - A	Core Course –VII: Advanced Algebra -I	WMAM31	5	6	Students will be able to CO1 Explain dual space, modules and linear Transformation CO2 Describe the concept of Triangular Matrices CO3 Demonstrate the concept of Nilpotent and Jordan form of Matrices CO4 Define Rational Canonical form of Matrix, Trace and Transpose and Determinants CO5 Explain Hermitian, Unitary and Normal Transformations
	Core Course -VIII: Complex Analysis	WMAM32	4	6	Students will be able to CO1 Explain analytic functions and power Series. CO2 Explain index of a point, integral formula, higher derivatives and removable singularities CO3 Demonstrate the concept of the general form of Cauchy’s theorem CO4 Describe the concept of definite integral and harmonic functions. CO5 Develop Taylor and Laurent series.
	Core Course -IX: Topology	WMAM33	5	6	Students will be able to CO1 Define and illustrate the concept of topological spaces and the basic definitions of open sets, neighbourhood, interior, exterior, closure and their axioms for defining topological space. CO2 Understand continuous functions, the product topology and metric topology. CO3 Understand Connected spaces, Components and Local Connectedness CO4 Understand Compact spaces, Limit Point Compactness and Local Compactness. CO5 Develop qualitative tools to characterize connectedness and compactness
	Core Course -X: Calculus of Variations and Integral Equations	WMAM34	4	5	Students will be able to CO1 Understand the Calculus of Variations and Applications CO2 Understand the Constraints and Lagrange’s Multipliers CO3 Integral Equations CO4 Explain the causes and effects of Linear Equations CO5 Explain the Hilbert Schmidt theory
	Elective - V: Mathematical Python Theory	WMAE32	4	4	Students will be able to CO1 demonstrate Problem Solving Techniques and Algorithmic Problem Solving CO2 Understanding of basic Python and Python functions in mathematical problem solving
Part - B	SEC - II: Programming in C++	WMASE33	2	3	Students will be able to CO1 To understand the structure of C++ program CO2 Explain Control Structures- Functions in C++. CO3 Explain all functions classes and Objects.

					CO4 Explain the Nesting of member functions CO5 Explain Constructors and Destructors
	Internship / Industrial Activity/ Field visit/ Research Knowledge updation Activity / Literacy Internship Report to be submitted to the Department (Carried out in minimum 20 hours)		2	External Valuation required	On completion of this course, students will / can; CO1 Enhance the professional competency to conduct field work. CO2 Gain practical knowledge related to their studies. CO3 Help student to understand the subject theories and methodology better. CO4 Gain particle skill and knowledge. CO5 Increase the employment prospect of the student
Semester – IV M. Sc. Mathematics					
Part - A	Core Course –XI: Advanced Algebra -II	WMAM41	5	6	Students will be able to CO1 Prove theorems by applying algebraic ways of thinking like extension fields and Algebraic extensions. CO2 Explain the nature of roots of Polynomials. CO3 Compose clear and accurate proofs using the concepts of Galois Theory. CO4 Bring out insight into Finite fields CO5 Demonstrate knowledge and understanding of fundamental concepts including a theorem of Frobenius, Integral Quaternions and the Four - Square theorem.
	Core Course -XII: Functional Analysis	WMAM42	4	6	Students will be able to CO1 Understand the Banach spaces and Transformations on Banach Spaces. CO2 Prove open mapping theorem. CO3 Describe operators and fundamental theorems. CO4 Validate spectral theorem. CO5 Analyze and establish the regular and singular elements
	Project with Viva Voce	WMAM43	7	10	On completion of this course, students will / can; CO1 Gives the student a skill such as problem solving, and helps to develop additional skills integral to their Future , such as critical thinking and time management. CO2 Enhance their knowledge through practicals and experience.

					<p>CO3 Be developed interpersonal skills and decision-making skills.</p> <p>CO4 Give a platform to demonstrate his/her abilities.</p> <p>CO5 Be able to identify the strength and weakness, which will help them to enhance and improve their ability.</p>
	Elective - VI: Mathematical Python - Practical	WMAE42	4	5	<p>Students will be able to</p> <p>CO1 Write programs using advanced concepts of Python.</p> <p>CO2 Write, Test and Debug Python Programs.</p> <p>CO3 Implement Conditionals and Loops for Python Programs.</p> <p>CO4 Use functions and represent Compound data using Lists, Tuples and Dictionaries.</p> <p>CO5 Read, write and manipulate data from & to files in Python.</p>
Part - B	SEC - III: Programming in C++ -Practical	WMASE43	2	3	
Part - C	Extension Activity /Pollution Awareness/Literacy / Voluntary Services Report to be submitted to the Department		1	External Valuation required	<p>On completion of this course, students will / can;</p> <p>CO1 Is a learning-teaching methods connect meaningful community service to academic curricula</p> <p>CO2 Service-learning blends community service goals and formal and informal (standard/academic and experiential/non-standard) educational goals in a manner that benefits participants and recipients.</p> <p>CO3 Extension activities and learning is a set of techniques and tools that can strengthen community relationships and connections.</p> <p>CO4 Extension contributes to national development programmers.</p> <p>CO5 It enhances leadership and team work qualities among the students</p>