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

Semester – I				B. Sc. Mathematics	
Part	**Course Name**	**Course Code**	**Credit**	**Hours**	**Course Outcome**
Part - III	Core Course – I: **Algebra & Trigonometry**	FCMA11	4	4	Students will be able to **CO1** Classify and solve reciprocal equations **CO2** Find the sum of powers of the roots of an equation **CO3** Find the sum of binomial, exponential and logarithmic series **CO4** Expand the powers and multiples of trigonometric functions in terms of sine and cosine **CO5** Determine relationship between circular and hyperbolic functions.
	Core Course - II: **Differential Calculus**	FCMA12	4	4	Students will be able to **CO1** Find thenth derivative, form equations involving derivatives and apply Leibnitz formula **CO2** Find the partial derivative and total derivative coefficient **CO3** Determine the maxima and minima of functions of two variables **CO4** Find the envelope of a given family of curves **CO5** Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates
Part - IV	SEC-1: **Mathematics for Competitive Examination 1**	FSMA11	2	2	Students will be able to **CO1** Simplify an expression and to find average for given data **CO2** Find solution of problems on numbers **CO3** Find Profit and Loss **CO4** Find Ratio and proportion **CO5** Find Percentages.
	Foundation Course: **Bridge Mathematics**	FFMA11	2	2	After completion of this course successfully, the students will be able to **CO1** Prove the binomial theorem and apply it to find the expansions of any $x + yn$ and also, solve the related problems. **CO2** Find the various sequences and series and solve the problems related to them. Explain the principle of counting.

					CO3 Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations **CO4** Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations. **CO5** Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.
		Semester – II		**B. Sc. Mathematics**	
Part - III	Core Course –III : **Analytical Geometry (Two & Three Dimensions)**	FCMA21	4	4	Students will be able to **CO1** Find pole, polar for conics, diameters, conjugate diameters for ellipse and hyperbola **CO2** Find the polar equations of straight line and circle, equations of chord, tangent and normal **CO3** Explain in detail the system of Planes **CO4** Explain in detail the system of Straight lines **CO5** Explain in detail the system of Spheres
	Core Course -IV: **Integral Calculus**	FCMA22	4	4	Students will be able to **CO1** Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae **CO2** Evaluate double and triple integrals and problems using change of order of integration **CO3** Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution **CO4** Explain beta and gamma functions and to use them in solving problems of integration **CO5** Explain Geometric applications of integral calculus.
Part - IV	SEC - 2: **Mathematics for Competitive Examination**	FSMA21	1	2	Students will be able to **CO1** Explain chain rule **CO2** Explain Time and work **CO3** Explain Pipes and Cistern **CO4** Find Time and Distance **CO5** Find Simple interest and Compound interest.
	SEC – 3: **LaTeX**	FSMA22	1	2	Students will be able to **CO1** Explain to type text and anatomy of an article **CO2** Explain the different comments and footnotes **CO3** Explain the changing of font characteristic **CO4** Explain different text environments **CO5** Know the spacing rules and operators.
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					Semester – III B. Sc. Mathematics
Part - III	Core Course –V : **Vector Calculus and Applications**	EMMA31	4	4	Students will be able to **CO1** Findthederivativeofvectorandsumofvectors,productofscalarandvector point function and to Determine derivatives of scalar and vector products **CO2** Applications of the operator,, del ''and to Explain solenoidal and irrotational vectors **CO3** Evaluate simple line integrals **CO4** Evaluate surface integrals and volume integrals **CO5** Verify the theorems of Gauss, Stoke''s and Green''s
	Core Course -VI : **Differential Equations and Applications**	EMMA32	4	4	Students will be able to **CO1** Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli''s equations and exact differential equations **CO2** Find the solutions of equations of first order but not of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products **CO3** Find solutions linear equations of second order and know some applications **CO4** Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals, to solve Lagrange''s equations **CO5** Explain standard forms of PDE and find solutions.
	Elective Course -3: **Statistics I**	EEST11	4	4	Students will be able to **CO1** Find coefficient of dispersion, moments, skewness and kurtosis **CO2** Find Karl Pearson''s correlation and rank correlation **CO3** Fit a straight line and parabolic curve by the method of least squares and find the regression lines and regression coefficients **CO4** Develop the statistical techniques used in the theory of attributes and to analyze consistency of data **CO5** Find the Index number.
Part - IV	SEC - 4: **Computational Mathematics**	ESMA31	2	2	On successful completion of the course, the Students will be able to **CO1** Describe the roots of algebraic equations using different methods like iteration method and Regula Falsie method **CO2** Find the real root of an equation by Bisection method, Newton-Raphson method and Horner''s method. **CO3** Solve a given system of simultaneous equation by using substitution and elimination methods **CO4** Solve a given system of simultaneous equation by using iteration method **CO5** Find numerical solutions of Partial Differential.

	EVS: **Environmental Studies**	EEVS31	2	2	Upon completion of this course, Students would have **CO1** To have a basic knowledge of Natural resources its classification, concepts, and natural resources of India. **CO2** To obtain knowledge on different types of ecosystem **CO3** To understand the values of biodiversity and conservation on global, national, and local scales **CO4** To gain knowledge on different types of pollution in the environment **CO5** To introduce the students in the field of Law and Policies and Acts both at the national and international level relating to environment.
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colspan	**Semester – IV B. Sc. Mathematics**				
Part - III	Core Course –VII: **Sequence and Series**	EMMA41	4	4	Students will be able to **CO1** Explain Sequence and Subsequence of real numbers and to find the limit of sequence to test for convergent, divergent and bounded sequences **CO2** Know the behaviour of monotonic sequences and the Cauchy sequence **CO3** Explain series and to verify convergent of series by using comparison test **CO4** Understand Kummer"s test and Ratio test **CO5** Classify the series of real numbers and the alternating series and their convergence and divergence, the conditional convergence and absolute convergence and solve problems on convergence of the sequences.
	Core Course -VIII: **Fourier Series and Integral Transforms**	EMMA42	4	4	Students will be able to **CO1** Determine the Fourier coefficients and Fourier series for a given periodic function **CO2** Determine the Half range Fourier series and the complex form of Fourier series. **CO3** Find the Fourier transform of a given function and to know the properties of FT **CO4** Find the Laplace transform of periodic functions and evaluation of certain integrals **CO5** Find the inverse Laplace transform and to solve differential equations using Laplace transform
	Elective Course -4: **Statistics II**	EEST21	4	4	Students will be able to **CO1** Define Random variables, Probability mass function, Probability density function, and Distribution functions **CO2** Compute Expectation, Variance and Covariance **CO3** Know about Moment Generating functions and Characteristic functions **CO4** Solve problems involving the concepts of theoretical discrete distributions **CO5** Solve problems involving the concepts of theoretical continuous distributions.

Part	Course	Code			Course Outcomes
	SEC - 5: **GeoGebra**	ESMA41	2	2	Students will be able to **CO1** Install the GeoGebra App and draw geometrical figures **CO2** Know the commands and functions used in GeoGebra **CO3** Export of Pictures to the Clipboard and Insert Pictures into the Graphics View **CO4** Insert Text into the Graphics View **CO5** Combine Spreadsheet View & Graphics View.
Part - IV	VBE: **Value Based Education**	EVBE41	2	2	**CO1** Identify the contribution of social reformers and factors that influence social justice **CO2** Compare and list the legal rights provided to women, children, Dalits, minorities and physically challenged as per human rights and Indian constitution **CO3** Stay as a responsible citizen and raise voice for any violence against women **CO4** analyze the prospects and challenges in mass media role of media in **CO5** assess the influence of new media on children and youth and use them to inculcate communal harmony and social justice **CO6** frame their own personal values based on social ethics to moderate the social issues and lead a secular society
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Part	Course	Code			Course Outcomes
Part - III	Core-V: Paper-VII: **Linear Algebra**	CMMA51	4	5	On successful completion of the course, the students should be able to **CO1** Explain the definitions and general properties of vector spaces. Also to explain subspace. They know where to apply fundamental theorem of homomorphism. **CO2** Determine the span of a set and to check whether the given set is Linearly dependent or not. Also to find basis and dimensions. **CO3** Illustrate and apply Rank Nullit theorem. Explain the definitions and examples of inner product space. Apply Gram Schmidt Orthogonalization process. **CO4** Construct matrices and also to summarize the elementary transformations. Determine the Inverse of matrix and rank of a matrix. To make use of Cayley Hamilton Theorem. **CO5** Determine Eigen Values and Eigen Vectors. Identify bilinear forms and quadrati forms. Also To deduce Diagonal form from Quadratic form.
	Core-VI: Paper - VIII: **Real Analysis**	CMMA52	4	5	On successful completion of the course, the students should be able to **CO1** Explain about Metric spaces and to construct an open ball. Also to interpret interior **CO2** Interpret about closed sets and to find closure. To determine limit points. Analyze about complete metric space. Discuss about Cantor's intersection theorem and Baire's Category theorem.

					CO3 Summarize continuity. Illustrate about uniform continuity. **CO4** Explain about connectedness and to deduce the connected subsets of R. To obtain the relationship between connectedness and continuity **CO5** Illustrate about compactness and to find the connected subsets of R. Illustrate and make use of Heine Borel Theorem .To determine the relationship between compactness and continuity.
	Core -VII: Paper - IX: **Statics**	CMMA53	4	5	On successful completion of the course, the students should be able to **CO1** Explain the forces acting at a point and to apply the parallelogram law of forces, Triangle law of forces and Lami's theorem. **CO2** Interpret parallel forces and moments. Analyse the resultant of two parallel forces and the resultant of two unlike unequal parallel forces. To apply Varigon's theorem. **CO3** Summarize equilibrium of three forces acting on a rigid body and to illustrate three coplanar forces theorem and to make use of the above theorem to solve problems **CO4** Explain about laws of friction. Also to determine the angle of friction and Illustrate about the equilibrium of a particle and to make use of the concepts to solve the problems. **CO5** Interpret the equilibrium of strings. To deduce the equation of catenary and its geometrical properties.
	Core -VIII: Paper - X: **Integral Transforms and Z Transforms**	CMMA54	4	5	On successful completion of the course, the students should be able to **CO1** Apply Fourier transforms and to explain the properties. **CO2** Solve problems on infinite Fourier cosine and Sine Transforms **CO3** Identify and solve Finite Fourier transforms **CO4** Illustrate Z transforms and its properties. **CO5** Utilize inverse Z transforms to solve difference equations.
	Major Elective - I: Paper -XI: **Discrete Mathematics**	CEMA52	4	4	On successful completion of the course, the students should be able to **CO1** Illustrate and use the statements, notations and connectives .Construct truth table and utilize conditional and biconditional statements. **CO2** Analyze and explain Predicate calculus K1,K4 **CO3** Elaborate Groups and monoids. Also to develop Group codes **CO4** Construct Lattices and special lattices. Analyze and explain Boolean algebra **CO5** Convert From one form to another form (Decimal, Binary, Octal, Hexadecimal). Evaluate Binary addition, subtraction multiplication and division
	Major Elective - II: Paper -XII: **Operations**	CEMA54	4	4	On successful completion of the course, the students should be able to **CO1** Solve Linear Programming Problem by making use of Graphical method, Simplex method. **CO2** Interpret the concept of duality. Classify primal and dual problems. Utilizing the concept of duality,

					solve problems on dual simplex method.
	Research				**CO3** Solve Transportation problems by making use of North – west corner rule, Matrix- Minima method, Vogel's Approximation rule. Evaluate Degeneracy and unbalanced transportation problems.
					CO4 Determine the solution for Assignment problems.
					CO5 Solve sequencing problems.
Part - IV	Skill Based Common: **PERSONALITY DEVELOPMENT**	CCSB51	2	2	
			Semester – VI		**B. Sc. Mathematics**
Part - III	Core-IX: Paper-XIII: **Complex Analysis**	CMMA61	4	5	On successful completion of the course, the students should be able to **CO1** Explain analytic functions and determine the functions of a complex variables and to utilize Cauchy Reimann equations **CO2** Elaborate Bilinear Transformations and classify the elementary transformations. Also to find fixed points. **CO3** Illustrate complex integrations and to make use of Cauchy's Integral Formula **CO4** Explain Series Expansions and to determine Taylor's Series, Laurent's Series. Determine zeros of an analytic function. **CO5** Determine residues and to make use of Cauchy's Residue Theorem. Also to evaluate definite integrals
	Core-X: Paper - XIV: **Graph Theory**	CMMA62	4	5	On successful completion of the course, the students should be able to **CO1** Construct graph and to explain its definition. Determine degrees. Also to perform operations on graph **CO2** Classify degree sequence and graphic sequence. Illustrate connectedness, compactness and connectivity. **CO3** Construct Eulerian Graphs and Hamiltonian graphs. Elaborate the characterizations of trees and to find centre of a tree. **CO4** Interpret Planar graphs and to determine chromatic numbers and chromatic index. **CO5** Explain Chromatic Polynomials and the properties of digraphs.
	Core -XI: Paper-XV: **Number Theory**	CMMA63	4	4	On successful completion of the course, the students should be able to **CO1** Explain Peano's theorem and to utilize mathematical induction. Also to make use of binomial theorem **CO2** Illustrate Division Algorithm .Determine GCD .To deduce the Diaphantine equation ax+by=c

					CO3 Intrepret the fundamental theorem of arithmetic. Explain The Sieve of Eratosthenes and to use Goldbach Conjecture.
					CO4 Summarize the basic properties of congruences and to apply Chinese Remainder Theorem
					CO5 Elaborate Fermat's Theorem, Wilson's Theorem and to apply Kraitchik Factorization Method.
Core-XII: Paper-XVI: **Dynamics**	CMMA64	4	4	On successful completion of the course, the students should be able to **CO1** Illustrate projectiles and to find the equation of path, range and maximum height and time of flight. **CO2** Elaborate about the collision of elastic bodies. Interpret law of impact and classify direct and oblique impact. **CO3** Determine simple harmonic motion in a straight line. Summarize the composition of SHM of the same period in the same line and along two perpendicular directions. **CO4** Interpret motion under the action of central forces. Derive velocity and acceleration in polar coordinates. **CO5** Obtain the differential equation of central orbit. Also to deduce the pedal equation of central orbit.	
Core -XIII: Paper - XVII: **Numerical Methods**	CMMA65	4	4	On successful completion of the course, the students should be able to **CO1** Obtain solution for numerical algebraic and Transcendental equations by making use of various methods. **CO2** Find finite difference for first and higher order differences. To classify forward and backward differences. **CO3** To apply interpolation formula in Newton's Forward and backward, Guass Forward and backward formula. **CO4** Make use of numerical differentiation and integration in Newton's forward & backward differences for differentiation. Also to utilize Trapezoidal rule and Simpson's 1/3 and 3/8 rule. **CO5** Solve Difference equations and to determine the order and degree of difference equation. Solve linear difference equation and find complementary function and to deduce particular Integral of the function.	
Major Elective -III: Paper-XVIII: **Fuzzy Mathematics**	CEMA62	4	4	On successful completion of the course, the students should be able to **CO1** Explain Crisp sets and fuzzy sets and illustrate the characteristics and significance of Paradigm Shift. **CO2** Elaborate the Additional properties of α cuts and the extension principle for fuzzy sets. **CO3** Perform fuzzy set operations. Also to determine fuzzy complements, fuzzy intersections and fuzzy unions. **CO4** Determine fuzzy numbers and Linguistic variables. Apply arithmetic operations on intervals and on fuzzy numbers. Construct lattice of fuzzy numbers.	

					CO5 Analyze and classify fuzzy decision making, individual decision making, Multi person decision making problems
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			<td colspan="3" align="center">**Semester – I Allied Mathematics**</td>
Part - III	ALLIED MATHEMATICS - I: **ALGEBRA AND DIFFERENTIAL EQUATIONS**	FEMA11	3	5	Students will be able to **CO1** Form the equation, relation between the roots and classify and solve reciprocal equations **CO2** Find approximate solution to equations by Horner"s method **CO3** Findeigen values and eigen vectors for given square matrix and find inverse by using Cayley-Hamilton theorem **CO4** Find solution of differential equations and partial differential equations **CO5** Find Laplace transformation and inverse Laplace transformation for a given function.
			<td colspan="3" align="center">**Semester – II Allied Mathematics**</td>
Part - III	ALLIED MATHEMATICS - II: **VECTOR CALCULUS AND FOURIER SERIES**	FEMA21	3	5	Students will be able to **CO1** Find the derivative of vector and to find gradient, divergence and curl of a vector **CO2** Evaluate double and triple integrals **CO3** Find line, surface and volume integrals **CO4** Verify the theorems of Gauss,Stoke"s and Green"s **CO5** Find Fourier series of even and odd functions and half-range Fourier series.