



Annai Hajira Women's College
Department of Mathematics
(A Unit of As-Sathiq Educational Society)
(Affiliated to Manonmaniam Sundaranar University)

UG-Programme

B. Sc., Mathematics

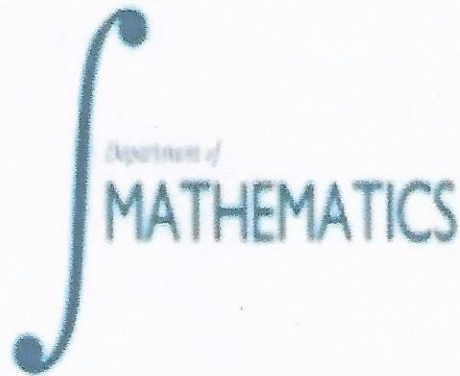
Choice Based Credit System

(with effect from the academic year 2016 – 2017 onwards)

Syllabus 2016 - 2019

PO, PSO & COs of Mathematics

Course Code: MA



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UG - Programme - Course Structure under CBCS

B.Sc - Mathematics

(Applicable to the candidates admitted from the academic year 2016 – 2017 onwards)

FIRST SEMESTER

Sub - Code	Subject Title	Lecture Hours	Credits
J1TL11	Part – I Tamil	6	3
J2EN11	Part – II English	6	3
JMMA11	Part – III Major Paper 1: Calculus	5	5
JMMA12	Part – III Major Paper 2 : Classical Algebra	5	5
JAMA11	Allied 1 : Algebra & Differential Equations	6	5
JEVS11	Part - IV : Environmental Studies	2	2
Total		30	23

SECOND SEMESTER

Sub - Code	Subject Title	Lecture Hours	Credits
J1TL21	Part – I Tamil	6	3
J2EN21	Part – II English	6	3
JMMA21	Part – III Major Paper 3 : Analytical Geometry	5	5
JMMA22	Part – III Major Paper 4: Differential Equations	5	5
JAMA21	Allied 2 : Vector Calculus & Fourier Series	6	5
JVBE21	Part – IV : Value Based Education	2	2
Total		30	23

THIRD SEMESTER

Sub - Code	Subject Title	Lecture Hours	Credits
J1TL31	Part – I Tamil	6	3
J2EN31	Part – II English	6	3
JMMA31	Part – III Major Paper 5 Real Analysis –I	6	5
JAST11	Allied II : Statistics I	6	5
JSMA3A	Skill Based: Vector Calculus	4	4
Total		28	20

FOURTH SEMESTER

Sub - Code	Subject Title	Lecture Hours	Credits
J1TL41	Part – I Tamil	6	3
J2EN41	Part – II English	6	3
JMMA41	Part III:Major Paper 6: Abstract Algebra I	5	5
JAST21	Allied II: Statistics II	6	5
JSMA4A	Part IV: Skill Based : Trigonometry, Fourier Series and Laplace Transforms	4	4
J5EA4A	Part V: Extension Activities : NCC/NSS/YRC/YWF/PE	1	1
Total		28	21

FIFTH SEMESTER

Sub - Code	Subject Title	Lecture Hours	Credits
JMMA51	Core 7 : Real Analysis II	7	5
JMMA52	Core 8 : Mechanics	7	5
JMMA5A	Major Elective I:Numerical Methods	6	5
JMMA5E	Major Elective II : Operations Research	6	5
JCSB5A	Skill Based Common : Personality Development	4	4
Total		30	24

SIXTH SEMESTER

Sub - Code	Subject Title	Lecture Hours	Credits
JMMA61	Core -9 : Abstract Algebra II	6	5
JMMA62	Core –10 : Complex Analysis	6	5
JMMA63	Core – 11 : Number Theory	6	4
JMMA64	Core – 12 : Graph Theory	6	5
JMMA6A	Major Elective III : Fuzzy Mathematics	6	5
Total		30	24

Programme Outcomes

On successful completion of B.Sc., program in Mathematics, the students are able to have	
PO1	Bachelor's Degree in Mathematics is the culmination of in – depth knowledge of Algebra, Calculus, Geometry, Differential Equations and Several other branches of Mathematics. This also leads to study of related areas like computer science, Statistics. Thus, this program helps the learners in building a social foundation for higher studies in Mathematics.
PO2	The skills and knowledge gained has intrinsic beauty, which leads to proficiency in analytic reasoning. This can be utilized in modelling and solving real life problems.
PO3	Students undergoing this program learn to logically questions assertions, to recognise patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly independence changing society.
PO4	Students completing this program will be able to present Mathematics clearly and precisely, make vague ideas precise by formulating them in the language of Mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of Mathematics to non-mathematician.
PO5	Completion of this program will also enable the learners to join teaching profession in primary and secondary schools.
PO6	This program will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

Programme Specific Outcome

After the completion of B.Sc., program in Mathematics, the students are able to have	
PSO1	A Solid Foundation in Knowledge: B. Sc., Degree is the culmination of depth knowledge of my core branches of Mathematics such as Calculus, Classical Algebra, Analytical Geometry, Differential Equations, Sequence and series, Abstract Algebra, Real and Complex Analysis, Number Theory, Mechanics, Operations Research, Statistics, Graph Theory, Discrete Mathematics, Trigonometry, Transforms and their Applications and C++/Python. Thus, this program helps students in creating a solid foundation for further higher studies and research in Mathematics.
PSO2	A Competency in Skills: The skills and knowledge gained have intrinsic logic which leads to proficiency in analytical reasoning critical understanding, analysis and synthetic in order to solve theoretical and practical problems. This can orient students towards applications of Mathematics in other disciplines and moreover, it can also be applied in modelling and solving the real-life problems.
PSO3	Problem Solving Techniques: Students undergoing this program learn to logically understand the question assertions to clarify the patterns and to evaluate the difference between the necessities and unnecessities of the problems which helps to analyze the problem clearly and to take correct decision for solving the problems.
PSO4	Interdisciplinary and Research Skills: Students completing this program will be able to create and present mathematical concepts clearly and precisely, to describe the mathematical ideas from multiple perspectives and to explain the fundamental concepts of mathematics people in a better manner.
PSO5	A Proficiency in Employments: The program will helps students build up with employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

Course Outcome

FIRST SEMESTER

The students are able to:

<p>JMMA11</p>	<p>Part III Major Paper 1: Calculus</p>	<p>CO1 Calculate the limit and examine the continuity and understand the geometrical interpretation of differentiability. CO2 Understand the consequences of various mean value theorem. CO3 Draw curves in Cartesian and polar coordinate system. CO4 understand conceptual variations while advancing from one variable to several variables in calculus. CO5 Realize importance of Green, Gauss and Stokes' theorems in other branches of mathematics CO6 Inter – relationship amongst the line integral, double and triple integral formulations.</p>
<p>JMMA12</p>	<p>Major Paper 2: Classical Algebra</p>	<p>CO1 Understand the basic theory of Equations. CO2 Understand the sum of the powers equations, Newton's theorems and Solve the different types of reciprocal equations. CO3 Find the number of real roots using Descartes rule of signs and study Roll's theorem. CO3 Study multiple roots and solve by using Newton's and Horner's method. CO5 Solve the cubic and biquadratic equations</p>
<p>JAMA11</p>	<p>Allied I : Algebra and Differential equations</p>	<p>CO1 Construct different types of equations and to compare and to find the relationships between roots and coefficients. CO2 Identify the transformation of equations and to find approximate solutions to equations by making use of Newton's method and Korner's method. CO3 Identify types of matrices and to find the characteristic equation of matrix. Eigen values and eigen vectors can be determined by applying Cayley Hamilton Theorem. CO4 Distinguish the differential equations of first order and higher degrees and to identify the equations which are all solvable for p, s, y and the equations in the standard form $Pp + Qq = R$. CO5 Identify and distinguish Laplace transformation and inverse Laplace transformation.</p>
<p>JEVS11</p>	<p>Part IV: Environmental Studies</p>	<p>CO1 Understand the definition, scope and importance of natural resources and associated problems. CO2 Study the different types of ecosystems, ecological succession food chains, food webs and ecological pyramids. CO3 Understand the definition of biodiversity and also study how to conserve. CO4 Analyze the various factors causing environmental pollution. CO5 Study various social issues which affect our environment.</p>

SECOND SEMESTER

The Students are able to:

JMMA21	Part III Major Paper 3: Analytical Geometry	<p>CO1 Demonstrate the Projection of the line joining two points, Cosines of the line joining two points and will be able to solve problems</p> <p>CO2 Illustrate circle and conics</p> <p>CO3 Analyze the 3D-co-ordinate systems and how to find the direction cosines and direction ratios. Also, to find the angle between planes, the length of the perpendicular and angle of bisection.</p> <p>CO4 The equations of spheres and circles of intersection can be interpreted and to illustrate and analyze the tangency of sphere.</p> <p>CO5 Solve the Equation of a different cones,</p>
JMMA22	Major Paper 4: Differential Equations	<p>CO1 Solve the differential equations which are all solvable for x, y, p and Clairaut's form. Also, to illustrate the method of solving the differentialequations of the form $f_1(D)x+g_1(D)y=h_1t, f_2(D)x+ g_2(D)y = h_2(t)$.</p> <p>CO2 Identify and solve the second order linear differential equation with constant coefficients</p> <p>CO3 Interpret the linear equations of second order with variable coefficients, homogeneous equations, equation reducible to homogeneous equation.</p> <p>CO4 Solve Partial differential equations, Formation of equations by elimination of arbitrary constants and functions</p> <p>CO5 Understand the application of differential equations and also study growth and decay, chemical reaction, Newton's law of cooling , Brochistocrone problem and simple electric circuit</p>
JAMA21	Allied II : Vector Calculus & Fourier Series	<p>CO1 Analyze what is meant by vector differentiation and how to apply vector differentiation and its properties.</p> <p>CO2 Evaluate the double and triple integrals</p> <p>CO3 Analyze and apply vector integration. By making use of Vector integration line, surface and volume integrals can be interpreted.</p> <p>CO4 Analyze and apply Green's, Stokes and divergence theorems</p> <p>CO5 Determine the functions whether the functions are odd or even. By making use of these concepts half range series can be found out.</p>
JVBE21	Part IV: Value Based Education	<p>CO1 Enable the students to understand the social realities and to inculcate an essential value system towards building a healthy society.</p> <p>CO2 Understand the importance of value-based living.</p> <p>CO3 Gain deeper understanding about the purpose of their life.</p> <p>CO4 Understand and start applying the essential steps to become good leaders</p> <p>CO5 Emerge as responsible citizens with clear conviction to practise values and ethics in life</p>

THIRD SEMESTER

The students are able to:

JMMA31	Part III Major Paper 5: Real Analysis I	<p>CO1 Analyse the real number system and also to classify rational and irrational numbers. To find the upper bounds, least upper bounds and maximum element and to elaborate triangle inequality and Cauchy-Schwartz inequality.</p> <p>CO2 Categorize the sequences as bounded sequences, monotonic sequences, convergent sequences and divergent sequences. Also to find the algebra of limits.</p> <p>CO3 Demonstrate the behaviour of monotonic sequences and to apply Cauchy's first limit theorem. Make use of Cauchy's Second limit theorem and Cesaro's Theorem. Construct subsequence and to explain Cauchy's general principle of convergence.</p> <p>CO4 Interpret the series and to apply n^{th} term test, Comparison test, Kummer's test, D'Alembert's ratio test, Raabe's test, Gauss test and root test to compile the nature of the series.</p> <p>CO5 Understand Alternating series, Leibnitz's test. Apply the test for convergence of series of arbitrary terms. Also to identify the Power series and to determine the radius of convergence.</p>
JAST11	Allied -I Statistics –I	<p>CO1 Find and relate the concepts of moments, skewness and kurtosis. Demonstrate the method of least squares. Illustrate parabolic, exponential and logarithmic curves.</p> <p>CO2 Interpret correlation and regression and illustrate Karl's Pearson's coefficient of correlation and also study the lines of regression and coefficient of regression.</p> <p>CO3 Develop the statistical techniques used in the theory of attributes and analyze consistency of data and criteria independence and to interpret Yule's coefficient of association.</p> <p>CO4 Explain distribution function and its properties, mathematical expectation and cumulants using generating function.</p> <p>CO5 Solve discrete and continuous probability distributions, explain about discrete distributions like Binomial and Poisson distribution and their properties.</p>
JSMA3A	Part IV Skill Based Vector Calculus	<p>CO1 Classify the vector point function and scalar point function. Determine the derivative of product of scalar and vector function.</p> <p>CO2 Find divergence, curl. Make use of the Laplacian operator.</p> <p>CO3 Interpret the integration of point function and to illustrate line integral. To solve surface integral.</p> <p>CO4 Analyze and solve the Volume integral. Also to illustrate and make use of Gauss Divergence Theorem to solve problems.</p> <p>CO5 To solve problems based on Green's Theorem and Stoke's Theorem.</p>

FOURTH SEMESTER

The students are able to:

<p>JMMA41</p>	<p style="text-align: center;">Part III Major Paper 6: Abstract Algebra I</p>	<p>CO1 Explain the definitions of groups and its examples. Also to determine the order of an element. Illustrate about Subgroups. CO2 Interpret cyclic groups and to find the generators of cyclic subgroups. Illustrate and apply Lagrange's Theorem, Euler's Theorem and Fermat's Theorem. CO3: Elaborate about Normal subgroups and group homomorphism. Illustrate Isomorphism, Automorphism. Also to apply Cayley's theorem wherever required. CO4: Compare and classify Rings and its types. Illustrate about Integral domain and Fields. To summarize about maximal and minimal ideals. CO5: Utilize the concept of homomorphism and isomorphism on rings. Also, to find kernel of homomorphism and to make use of fundamental theorem.</p>
<p>JAST21</p>	<p style="text-align: center;">Allied II Statistics II</p>	<p>CO1 Analyse any change in a variable or variables across a determined period by using the following: Laspeyer's and Paasche's, Fisher's and Bowley's Marshall and Edgeworth's index numbers, Tests, Unit test, Commodity Reversal test, Time Reversal test, circular test. CO2 Construct testing of hypothesis and to distinguish null hypothesis and alternative hypothesis. Type I and Type II errors can be classified. The level of significance and test of significance for large samples can be explained. CO3 Identify the distributions such as t-distributions and F-distribution. By making use of t-test the single mean and difference of means can be found out. Variance ratio test based on Chi-square distribution by making use of this the goodness of fit can be decided. CO4 To find analysis of variance, one way and two-way classified data, Basis of experimental design, Randomized Block Design, Latin square, simple problems. CO5 Understand the concept of Statistical Quality control, Definition, Advantages, Process control, Control chart, Mean chart, Range chart, P-chart, Product Control, Sampling Inspection Plans.</p>
<p>JSMA4A</p>	<p style="text-align: center;">Skill Based: Trigonometry, Laplace Transforms and Fourier Series</p>	<p>CO1 Summarize about Trigonometry and to illustrate about the expansion of $\sin nx$, $\cos nx$, $\sin^n x$, $\cos^n x$. CO2 Obtain the relationship between hyperbolic functions and circular function. Explain about inverse hyperbolic functions. To find summation of the series using C+ is method. Use visualization, spatial reasoning, as well as geometric properties and strategies to model and solve problems involving exponential and trigonometric functions, as well as their inverses CO3 Illustrate Laplace Transforms. CO4 Solving linear differential equations with constant coefficients and simultaneous equations using Laplace Transforms. CO5 Solve problems based on Fourier Series. Identify the odd and even functions and to deduce half range series.</p>

FIFTH SEMESTER

The students are able to:

JMMA51	Core -7 : Real Analysis II	<p>CO1 Explain about Metric spaces and to construct an open ball. Also, to interpret interior.</p> <p>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.</p> <p>CO3 Summarize continuity. Illustrate about uniform continuity. Discuss about discontinuous functions of \mathbb{R}.</p> <p>CO4 Explain about Connectedness and to deduce the connected subsets of \mathbb{R}. To obtain the relationship between Connectedness and continuity. Illustrate about Compactness. Illustrate and make use of Heine-Borel Theorem.</p> <p>CO5 Explain about Riemann Integral, understand the concept of derivatives. Explain about Rolle's theorem and Mean Value theorems.</p>
JMMA52	Core – 8 : Mechanics	<p>CO1 Explain the forces acting at a point and to apply the parallelogram law of forces, Triangle law of forces and Lami's theorem. Interpret parallel forces and moments. Analyse the resultant of two parallel forces and the resultant of two unlike unequal parallel forces. To apply Varignon's theorem.</p> <p>CO2 Interpret the equilibrium of strings. To deduce the equation of catenary and its geometrical properties.</p> <p>CO3 Illustrate Projectiles and to find the equation of path, range and maximum height and time of flight.</p> <p>CO4 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.</p> <p>CO5 Interpret motion under the action of central forces. Derive velocity and acceleration in polar coordinates.</p>
JMMA5A	Major Elective 1: Numerical methods	<p>CO1 Obtain numerical solutions of algebraic and transcendental equations by making use of various methods.</p> <p>CO2 Find finite difference for first and higher order differences. To classify Forward and backward differences.</p> <p>CO3 To apply interpolation formula in Newton's Forward and backward, Gauss forward and backward formula.</p> <p>CO4 Make use of numerical differentiation and integration in Newton's forward and backward differences for differentiation. Also, to utilize Trapezoidal rule and Simpson's 1/3 and 3/8 rule.</p> <p>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.</p>

JMMA5E	<p>Major Elective 2 : Operations Research</p>	<p>CO1 Solve linear programming Problem by making use of graphical method, Simplex method. Study Duality, Primal and Dual Problems, Dual Simplex Method.</p> <p>CO2 Study the method the transportation problem and also study MODI Method, Degeneracy and unbalanced transportation problem, assignment problem.</p> <p>CO3 Interpret the games and strategies. Solve two-person zero sum games. Make use of mixed Strategies and dominance property.</p> <p>CO4 Compose network scheduling using PERT / CPM. Explain the rules of network construction. Make use of PERT calculation.</p> <p>CO5 Analyze and solve inventory control problems.</p>
JCSB5A	<p>Skill Based Common: Personality Development</p>	<p>CO1 Develop, exhibit and accurate sense of self.</p> <p>CO2 Develop and nurture a deep understanding of personal Motivation.</p> <p>CO3 Develop an understanding and practice personal and Professional responsibility.</p> <p>CO4 Demonstrate knowledge of personal beliefs and values and a commitment to continue personal reflection and reassessment.</p> <p>CO5 Learn to balance confidence with humility.</p> <p>CO6 Assert strengthened personal character and further an enhanced ethical sense.</p>

SIXTH SEMESTER

The students are able to:

JMMA61	Part – III Core -9 : Abstract Algebra II	<p>CO1 Explain the definitions and general properties of vector spaces. Also, to explain subspace. They know where to apply fundamental theorem of homomorphism.</p> <p>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</p> <p>CO3 Illustrate and apply Rank Nullity theorem. Explain the definitions and examples of inner product space. Apply Gram Schmidt Orthogonalization process.</p> <p>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.</p> <p>CO5 Determine Eigen values and Eigen Vectors. Identify bilinear forms and quadratic forms. Also, to deduce diagonal form from quadratic form.</p>
JMMA62	Core –10: Complex Analysis	<p>CO1 Understand the concept of analytical functions and study Functions of a complex variable and to utilize Cauchy - Riemann equations.</p> <p>CO2 Understand the concept of definite integrals, contours. Also, study Cauchy – Goursat theorem, Cauchy integral formula and Morera’s theorem.</p> <p>CO3 Explain Series expansions and to determine Taylor’s Series, Laurent’s Series. Determine zeros of an analytic function, residues and to make use of Cauchy’s Residue Theorem.</p> <p>CO4 Evaluate improper real integrals and definite integrals.</p> <p>CO5 Study the basic properties of transformations, bilinear maps and fixed points.</p>
JMMA63	Core – 11: Number Theory	<p>CO1 Explain Peano’s theorem and to utilize mathematical induction. Also, to make use of binomial theorem.</p> <p>CO2 Illustrate Division Algorithm. Determine GCD. To deduce the Diophantine Equation $ax+by = c$.</p> <p>CO3 Study the concept of the fundamental Theorem of Arithmetic, The Sieve of Eratosthenes, The Goldbach conjecture</p> <p>CO4 Learn the basic properties of congruences, Linear congruence and the Chinese Remainder Theorem.</p> <p>CO5 Study the concept of Fermat’s Theorem, Wilson’s Theorem, The Fermat – Kraitchik Factorization Method.</p>

JMMA64	<p align="center">Core – 12 : Graph Theory</p>	<p>CO1 Construct graph and to explain its definition. Determine degrees. Also, to perform operations on graph.</p> <p>CO2 Understand the concept of Degree sequences, graphic sequences, walks, trails and paths, connectedness and components – connectivity.</p> <p>CO3 Interpret planar graphs.</p> <p>CO4 Explain Graph.</p> <p>CO5 Determine chromatic numbers and chromatic index Explain chromatic polynomials and the properties of digraphs.</p>
JMMA6A	<p align="center">Major Elective 3 : Fuzzy Mathematics</p>	<p>CO1 Explain Crisp Sets and fuzzy Sets and illustrate the characteristics and significance of Paradigm shift</p> <p>CO2 Elaborate the Additional properties of α-cuts and the extension principle for fuzzy sets</p> <p>CO3 Perform fuzzy set operations. Also, to determine fuzzy complements, fuzzy intersections and fuzzy unions.</p> <p>CO4 Determine fuzzy Numbers and Linguistic variables. Apply arithmetic operations on intervals and on fuzzy numbers. Construct Lattice of fuzzy numbers.</p> <p>CO5 Analyze and classify fuzzy Decision Making, Individual Decision Making, Multi-person decision making problems.</p>

M. A. Usha Srin

Signature of the HoD 16/06/2016

Head of the Department of
Mathematics

Annai Hajira Women's College
Melapalayam

Lajana Dhalu

Signature of the Principal 16/06/2016

PRINCIPAL

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