THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC,
College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

DEPARTMENT OF MATHEMATICS

UG DEGREE PROGRAMME IN MATHEMATICS

PROGRAMME EDUCATIONAL OBJECTIVES	
The Graduates will	
PEO1.	be proficient in statistical and computational skills, help them to shine in Govt./private sectors, Banks, Railways, IT etc.,
PEO2.	be excellent in computing ability to comprehend, analyze and design solutions for real life problems.
PEO3.	attend confidently the competitive exams and entrance exams like TNPSC, SSC,RRB and TANCET/GATE etc.,
PEO4.	understand the professional, ethical, legal, security, social issues and responsibilities

PROGRAMME SPECIFIC OUTCOMES	
By the Completion of B.Sc **MATHEMATICS** programme, the learners will be able to	
PSO1.	impart knowledge on the basics of core branches of Mathematics like Algebra, Analysis, Calculus, Vector Algebra, Trigonometry and Number theory.
PSO2.	formulate, convert in to mathematical modelling and apply mathematical techniques to solve problems in science and various disciplines.
PSO3.	analyse mathematical theorems and apply the concepts to arrive at solutions for real life mathematical problems.
PSO4.	communicate effectively about Mathematics to both layman and expert audiences utilizing appropriate information and communication technology.
PSO5.	work independently and collaborate effectively in team to achieve their goal.
PSO6.	recognize the importance of adhering to science and its ethical values and become a responsible citizen.
PSO7.	conduct self evaluation and continuously enrich themselves through life-long learning.

COURSE OUTCOME

Core Course	
Course Code: GLMT11	**Course Title: CALCULUS AND TRIGONOMETRY**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of differentiation, integration, hyperbolic function and trigonometric series
CO2.	estimate the solution for the problems in calculus , hyperbolic function and trigonometric series
CO3.	determine the area and volume of the surfaces.
CO4.	calculate the solution to the problems in Calculus and Trigonometry.
CO5.	simplify the problems in Calculus and Trigonometry

Core Course	
Course Code: GLMT12	**Course Title: AG3D AND VECTOR CALCULUS**
On successful completion of the course, the learners should be able to	
CO1.	list the types of equations of planes and straight lines, spheres, list the formulas in vector algebra and Green's ,Gauss's and Stoke's theorems
CO2.	apply appropriate tools and techniques to solve problems in straight lines, planes and volume of surfaces
CO3.	discuss the concept of planes and volume of surfaces, spheres and solve problems in vector algebra.
CO4.	evaluate multiple integrals using Green's, Gauss's and Stoke's theorems
CO5.	analyze the knowledge in solving problems on plane, line, sphere, and Integrals,gradient curl,Green's,Gauss's and Stoke's theorems

Core Course	
Course Code: GLMT21	**Course Title: THEORY OF EQUATIONS**
On successful completion of the course, the learners should be able to	
CO1.	Explain the fundamental concepts of roots, coefficients, nature and position of algebraic, cubic, biquadratic and reciprocal equations.
CO2.	make use of relation between roots and coefficients to find sum of the powers of the roots, roots of reciprocal equations and to transform the equation whose roots are diminished or increased.
CO3.	compute nature and position of roots of the equation and to solve cubic and biquadratic equations.
CO4.	analyze the equation for the existence of real and imaginary roots and its nature and position
CO5.	estimate exact or approximate solution for any numerical equations

Core Course	
Course Code: GLMT22	**Course Title: NUMERICAL METHODS**
On successful completion of the course, the learners should be able to	
CO1.	define algebraic, transcendental, simultaneous equations, finite difference, forward, backward, central difference operators.
CO2.	apply various numerical methods to solve algebraic, transcendental, simultaneous equations.
CO3.	compute missing data by interpolation techniques and estimate differentiation and integration by numerical methods.
CO4.	analyze data by using numerical differentiation, numerical integration and by interpolation.
CO5.	determine approximate solution for any type of equation by numerical iteration methods.

Core Course	
Course Code: GLMT31	**Course Title: MODERN ALGEBRA**
On successful completion of the course, the learners should be able to	
CO1.	list out the basic concepts in Groups, Rings and Fields.
CO2.	prove the properties and results in algebraic structure
CO3.	apply the properties and results of groups to solve problems.
CO4.	examine the equivalence criterions and characteristics of groups and rings of various types.
CO5.	justify the statements in algebraic structure by giving proof or by giving example.

Core Course	
Course Code: GLMT32	**Course Title: DIFFERENTIAL EQUATIONS**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of ODE and PDE.
CO2.	estimate the problems of ODE and PDE.
CO3.	apply various methods to solve differential equations.
CO4.	solve the ODE and simultaneous linear differential equations by using Laplace and inverse Laplace transforms
CO5.	examine the different forms of ODE and PDE for finding the solutions.

Allied Course	
Course Code: GLMT3A1	**Course Title: ALLIED MATHEMATICS I**
On successful completion of the course, the learners should be able to	
CO1.	explain the fundamentals of Ordinary and Partial Differential equations also Laplace transform and its inverse.
CO2.	classify Differential equations of first order first degree and linear equation of higher order and examine solution
CO3.	solve different types of ODE and PDE by applying differentiation and Laplace transform techniques
CO4.	estimate solution for science discipline problems by applying differential equation concepts.
CO5.	analyze differential equations for practical oriented problems.

Allied Course	
Course Code: GLMT3A	**Course Title: PROGRAMMING IN C**
On successful completion of the course, the learners should be able to	
CO1.	define the basic concepts of C Language.
CO2.	discuss user defined functions, structures, unions, pointers and files.
CO3.	apply decision making and looping statements to create simple programs
CO4.	build simple programs using functions, arrays and file.
CO5.	infer the concept of pointers, structures and unions.

Allied Course	
Course Code: GLMT3AL	**Course Title: PROGRAMMING IN C LAB**
On successful completion of the course, the learners should be able to	
CO1.	choose conditional control making statements to solve the problems.
CO2.	develop programming skills.
CO3.	analyze the concepts of functions and structures.
CO4.	deduct and rectify errors in programs.
CO5.	design programs for real life situation.

Elective Course	
Course Code: GLMT3N	**Course Title: STATISTICAL METHODS**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of various measures of central tendency, measures of dispersion and correlation.
CO2.	solve the problems in statistics
CO3.	compute various measures of dispersion.
CO4.	explain correlation analysis.
CO5.	develop computational skills.

Core Course	
Course Code: GLMT41	**Course Title: GRAPH THEORY**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of graph theory.
CO2.	discuss the properties of different types of graphs like Eulerian, Hamiltonian, bipartite, trees and planar graphs.
CO3.	apply logical argument / algorithm for proving characterization, equivalence criterions on various concepts of graph theory.
CO4.	identify the properties of vertex colouring and edge colouring in graphs.
CO5.	analyze the behavior of various kinds of graphs

Core Course	
Course Code: GLMT42	**Course Title: SEQUENCES AND SERIES**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of sequences and series
CO2.	discuss the properties of different types of sequences like convergent, divergent and oscillating sequences.
CO3.	apply logical argument for proving characterization, equivalence criterions on various concepts of sequences and series.
CO4.	identify the nature of sequences and series.
CO5.	analyze the behavior of series by applying various tests.

Allied Course	
Course Code: GLMT4A1	**Course Title: ALLIED MATHEMATICS II**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts in vector calculus, finite differences and algebraic structure.
CO2.	apply the theorems and results in vector calculus to find line and surface integrals.
CO3.	estimate missing data by interpolation and prove the properties and results in finite difference and algebraic structure.
CO4.	classify equivalence criterion and properties of vectors, finite difference operators and groups.
CO5.	evaluate multiple integrals and missing data by interpolation.

Allied Course	
Course Code: GLMT4A	**Course Title: PROGRAMMING IN C++**
On successful completion of the course, the learners should be able to	
CO1.	explain the principles of OOP and distinguish classes and objects.x
CO2.	develop knowledge on constructors and destructors.
CO3.	analyze characteristics of an object-oriented programming language.
CO4.	compare the types of inheritance.
CO5.	create program using concept OOP.

Allied Course	
Course Code: GLMT4AL	**Course Title: PROGRAMMING IN C++ LAB**
On successful completion of the course, the learners should be able to	
CO1.	define the basic concepts of OOPs.
CO2.	develop programs using constructor and destructor.
CO3.	distinguish operator overloading and function overloading.
CO4.	deduct and rectify the errors in programs
CO5.	improve programming skills.

Discipline Specific Course	
Course Code: GLMT4DS	**Course Title: COMBINATORICS**
On successful completion of the course, the learners should be able to	
CO1.	explain the rules of sum and product of permutations and combinations.
CO2.	apply counting principles to find solution to real life problems.
CO3.	analyze inclusion and exclusion principle.
CO4.	evaluate solutions by the technique of generating functions.
CO5.	develop problem solving skills.

Elective Course	
Course Code: GLMT4N	**Course Title: NUMERICAL METHODS**
On successful completion of the course, the learners should be able to	
CO1.	define algebraic and transcendental equations.
CO2.	apply various methods to solve simultaneous equations
CO3.	analyze various finite difference operators.
CO4.	determine the missing data using finite differences.
CO5.	improve computational skills in solving problems

Core Course	
Course Code: GLMT51	**Course Title: REAL ANALYSIS**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of metric spaces and their properties.
CO2.	discuss open, closed, complete, continuity, connected compact sets and convergent function defined on metric spaces.
CO3.	apply the properties of open sets, closed sets, complete, continuity, discontinuity and uniform continuity, connectedness with continuity, compactness with continuity.
CO4.	identify the behaviour of complete metric space.
CO5.	analyze the characteristics and equivalence criterions of various concepts of real line.

Core Course	
Course Code: GLMT52	**Course Title: LINEAR ALGEBRA**
On successful completion of the course, the learners should be able to	
CO1.	define vector spaces, product spaces and theory of matrices.
CO2.	solve system of simultaneous linear equations and computing eigen values ,eigen vectors.
CO3.	develop knowledge on vector spaces and inner product spaces and matrices
CO4.	apply the concepts of basis, dimension of vector spaces, inner product spaces and matrices to solve problems.
CO5.	analyze the characteristics of vector spaces, inner product spaces and matrices

Core Course	
Course Code: GLMT5L	**Course Title: Maple Lab**
On successful completion of the course, the learners should be able to	
CO1.	list the technical codings for efficient usage of Maple software.
CO2.	identify the techniques of the mathematical software to solve real life problems.
CO3.	analyze the codings to find eigen values and inverse of any square matrix.
CO4.	determine the values of trigonometric and algebraic functions.
CO5.	develop programming skill in solving differential equation.

Elective Course	
Course Code: GLMT5E1	**Course Title: LINEAR PROGRAMMING**
On successful completion of the course, the learners should be able to	
CO1.	explain LPP, canonical & standard form, primal-dual form and sub / special classes of LPP.
CO2.	express real life problem into mathematical form.
CO3.	apply efficient computational techniques and algorithms that are needed to solve optimization problems, sub / special classes of LPP.
CO4.	determine basic, feasible, infeasible, IBFS, unbounded, degenerate / non degenerate solutions to a LPP,TP and AP.
CO5.	examine the balanced / unbalanced TP / AP.

Elective Course	
Course Code: GLMT5E2	**Course Title: FOURIER ANALYSIS**
On successful completion of the course, the learners should be able to	
CO1.	define the expansion of periodic functions.
CO2.	construct Fourier series for any function.
CO3.	analyze the applications of Fourier integrals formula.
CO4.	evaluate the Fourier sine and cosine transform.
CO5.	construct the finite Fourier sine cosine transform.

Elective Course	
Course Code: GLMT5E3	**Course Title: DISCRETE MATHEMATICS**
On successful completion of the course, the learners should be able to	
CO1.	classify the basic principles of discrete Mathematical structures.
CO2.	explain the truth table for Tautology.
CO3.	apply the concept of Boolean algebra and its application in Karnaugh Map and switching circuits
CO4.	compute finite automation for strings.
CO5.	justify and evalute the types of Grammars and generate them for Languages.

Elective Course	
Course Code: GLMT5E4	**Course Title: MODERN APPLIED ALGEBRA**
On successful completion of the course, the learners should be able to	
CO1.	define algebraic systems, Boolean algebra and lattice.
CO2.	apply Modern Algebra to data communication.
CO3.	analyze the concepts of coding and decoding digital information.
CO4.	explain modular and geometric lattices.
CO5.	construct polynomial codes.

Core Course	
Course Code: GLMT61	**Course Title: COMPLEX ANALYSIS**
On successful completion of the course, the learners should be able to	
CO1.	explain the fundamental concepts of complex numbers.
CO2.	discuss the properties of various types of transformations, and expanded power series, integrations and residues.
CO3.	solve problems in complex numbers.
CO4.	identify the behaviour of conformal mapping and transformations.
CO5.	analyze the characteristics and equivalence criterions of various concepts of complex numbers

Core Course	
Course Code: GLMT62	**Course Title: NUMBER THEORY**
On successful completion of the course, the learners should be able to	
CO1.	explain g.c.d, l.c.m and several basic results on Number theory.
CO2.	describe the properties of congruences and primitive roots .
CO3.	apply effective computational techniques / mathematical arguments for proving characterization, criterions on different concepts of Number theory.
CO4.	solve various types of problems / congruences in context of theory of numbers using mathematical calculations/various familiar theorems.
CO5.	examine the properties of prime numbers and number theoretic functions.

Core Course	
Course Code: GLMT63	**Course Title: STATISTICS**
On successful completion of the course, the learners should be able to	
CO1.	classify the properties of correlation, regression ,index number and various distributions. .
CO2.	explain the concept of index numbers and various distributions .
CO3.	develop sampling techniques small and large sampling .
CO4.	apply the hypothesis by applying t, F and χ^2 test.
CO5.	justify sampling techniques.

Core Course	
Course Code: GLMT6L	**Course Title: MATLAB**
On successful completion of the course, the learners should be able to	
CO1.	explain the codings in MATLAB.
CO2.	apply MATLAB for solving Mathematical problems.
CO3.	analyze the roots of the equation and trace the curve.
CO4.	evaluate optimal solution of LPP by using MATLAB.
CO5.	compile and discuss regression lines.

Elective Course	
Course Code: GLMT6E1	**Course Title: OPERATIONS RESEARCH**
On successful completion of the course, the learners should be able to	
CO1.	explain the concepts of game theory,queueing theory, replacement policy.
CO2.	discuss various models in replacement policy, queueing theory.
CO3.	apply efficient computational techniques that are needed to solve optimization Problems in game theory , queueing theory, replacement policies.
CO4.	examine the techniques and solve problems on queueing theory, inventory control..
CO5.	evaluate problems in sequencing, inventory control.

Elective Course	
Course Code: GLMT6E2	**Course Title: APPLIED STATISTICS**
On successful completion of the course, the learners should be able to	
CO1.	define the concept of scaling of scores and reliability of test scores.
CO2.	develop knowledge in vital statistics.
CO3.	analyze the Z-Score and Z-Scale.
CO4.	compute the measurement of mortality.
CO5.	construct mortality table.

Elective Course	
Course Code: GLMT6E3	**Course Title: AUTOMATA AND FORMAL LANGUAGES**
On successful completion of the course, the learners should be able to	
CO1.	construct basic knowledge in automation and phrase structure grammars.
CO2.	apply the concepts in theoretical computer science.
CO3.	construct derivation trees.
CO4.	explain regular languages.
CO5.	build content free grammars languages.

Job oriented Course	
Course Code: GLJ066	**Course Title: CAREER MATHEMATICS**
On successful completion of the course, the learners should be able to	
CO1.	list down basic formulae in Mathematics.
CO2.	develop their numerical and aptitude skills.
CO3.	analyze and solve analytical, logical, verbal and non-verbal reasoning problems.
CO4.	evaluate various arithmetic and reasoning problems.
CO5.	improve their confidence level for attending competitive examinations

Job oriented Course	
Course Code: GLJ066L	**Course Title: CAREER MATHEMATICS LAB**
On successful completion of the course, the learners should be able to	
CO1.	find and choose the correct answers for various arithmetic problems.
CO2.	apply computational skills to solve real life problems.
CO3.	motivate to attend competitive examinations confidently.
CO4.	compare and conclude the solution for sequential problems.
CO5.	develop practical knowledge through on-line tests.

Extra credit Course	
Course Code: AMTEC1	**Course Title: MATHEMATICS FOR CAREER BUILDING**
On successful completion of the course, the learners should be able to	
CO1.	recall the formulae in mathematics.
CO2.	apply the problem solving skills to real life situations.
CO3.	develop skills to attend the competitive exams like banks, railway, LIC, SSC, TNPSC etc.
CO4.	analyze and solve verbal problems.
CO5.	compare and conclude the solutions for non verbal reasoning problems **.**

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DEPARTMENT OF MATHEMATICS

PG DEGREE PROGRAMME IN MATHEMATICS

PROGRAMME EDUCATIONAL OBJECTIVES The Graduates will	
PEO1.	have the caliber to work in various colleges, universities and shine in higher level administrations like UPSC,TNPSC, IBPS,etc.,
PEO2.	have the ability to pursue Research in any branch of Mathematics.
PEO3.	develop entrepreneurial skills, to be empowered according to the professional
PEO4.	requirement and become self dependent.

PROGRAMME SPECIFIC OUTCOMES By the Completion of M.Sc MATHEMATICS programme, the learners will be able to	
PSO1.	formulate and develop mathematical arguments in a logical manner.
PSO2.	tackle complex problems, reveal structures, clarify problems, discover suitable analytic / numerical methods and interpret solutions.
PSO3.	empowered to take up academic research.
PSO4.	communicate the recent trends of Mathematics in various fields effectively
PSO5.	work as a team member having skills for effective collaboration to ad hoc diverse purposes.
PSO6.	communicate professionally and face challenges ethically in the society.
PSO7.	recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of emerging trends in Mathematics.

COURSE OUTCOME

Core Course	
Course Code: HLMT11	**Course Title: ALGEBRA I**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of Group and ring theory.
CO2.	discuss the properties of Group and ring theory.
CO3.	apply the logical proof of algebraic structures.
CO4.	identify the study of algebraic structure in solvable groups.
CO5.	analyze the characteristics and equivalence criterions of various concepts of algebraic

Core Course	
Course Code: HLMT12	**Course Title: ANALYSIS I**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic topological properties of subsets of real numbers.
CO2.	discuss the topological properties, convergent, continuity and differentiability of functions defined on the subsets of the real line.
CO3.	identify the properties of metric space, sequences, series, continuity, uniform continuity and differentiation in real line.
CO4.	determine the convergent of sequences and series.
CO5.	analyze the characteristics and equivalence criterions of various concepts of real line.

Core Course	
Course Code: HLMT13	**Course Title: OPERATIONS RESEARCH**
On successful completion of the course, the learners should be able to	
CO1.	Explain the basic concepts and algorithms of network models, constrained and unconstrained problems.
CO2.	apply network algorithms to find minimal spanning tree, shortest route, maximal flow and critical path of network models
CO3.	solve constrained and unconstrained problems through optimization
CO4.	analyze shortest route, CPM and maximal flow problems by Linear Programming Formation.
CO5.	estimate time schedule for the project network by investigating critical and non-critical activities.

Core Course	
Course Code: HLMT13L	**Course Title: OPERATIONS RESEARCH-LAB**
On successful completion of the course, the learners should be able to	
CO1.	recall the basic concepts of network theory and non linear programming.
CO2.	apply TORA tools to solve network problems.
CO3.	analyze time schedule by PERT and CPM method
CO4.	determine the solution for the network models by using EXCEL spread sheet
CO5.	discuss the solving techniques of non-linear programming problems

Core Course	
Course Code: HLMT14	**Course Title: DIFFERENTIAL EQUATIONS**
On successful completion of the course, the learners should be able to	
CO1.	explain the fundamental concepts and methods of solving linear & non linear differential equations
CO2.	compute the general solutions of Legender, Euler and Bessel equations.
CO3.	make use of computation skills to find solution of linear and nonlinear differential equations.
CO4.	examine the properties and conditions for the existence of the solutions of differential equations
CO5.	evaluate the solutions of linear and nonlinear partial differential equations by using various

Elective Course	
Course Code: HLMT1E1	**Course Title: MATHEMATICAL MODELLING**
On successful completion of the course, the learners should be able to	
CO1.	explain the concepts of mathematical models
CO2.	apply differential equation models to solve problem in any disciplinary of science
CO3.	construct mathematical models for solving real life problems
CO4.	examine the various mathematical models in applied areas
CO5.	analyze problems in various fields and find solution using ODE and difference equations

Elective Course	
Course Code: HLMT1E2	**Course Title: NUMBER THEORY**
On successful completion of the course, the learners should be able to	
CO1.	explain the fundamental concepts of Number theory
CO2.	identify Mobius function and Euler totient function
CO3.	solve the problems on number theory.
CO4.	apply mathematical/ induction arguments for proving criterions.
CO5.	examine properties of congruences.

Core Course	
Course Code: HLMT21	**Course Title: ALGEBRA II**
On successful completion of the course, the learners should be able to	
CO1.	explain the fundamental concepts of linear transformations.
CO2.	discuss the various canonical forms and transformations.
CO3.	apply the properties of linear transformation for any matrix.
CO4.	identify the behaviour of trace, transpose, determinants.
CO5.	analyze the characteristics and equivalence criterions of various transformations.

Core Course	
Course Code: HLMT22	**Course Title: ANALYSIS II**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of integration, differentiation and measurable set.
CO2.	discuss the behaviour of functions of real line.
CO3.	apply various functions defined on subsets of real line.
CO4.	identify the behaviour of sequences and series of function.
CO5.	analyze the characteristics and equivalence criterions of various concepts of real line.

Core Course	
Course Code: HLMT23	**Course Title: TOPOLOGY**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of topological spaces
CO2.	identify various types of topological spaces
CO3.	construct the mathematical arguments that relate to the study of topological spaces.
CO4.	analyze the properties of continuous function in compact and connected spaces
CO5.	examine the characteristics and equivalence criterions of various concepts of topological

Core Course	
Course Code: HLMT24	**Course Title: GRAPH THEORY**
On successful completion of the course, the learners should be able to	
CO1.	Explain the fundamental concepts of graph theory
CO2.	Identify the properties of Euler tour, Hamilton cycles, matching, chromatic number and domination.
CO3.	Apply graph theoretic knowledge in real life situations.
CO4.	nalyze the behavior of various kinds of graphs.
CO5.	explain logical argument for proving characterization, equivalence criterions on Euler tour, Hamilton cycles, matching, chromatic number and domination.

Elective Course	
Course Code: HLMT2E	**Course Title: QUANTITATIVE TECHNIQUES**
On successful completion of the course, the learners should be able to	
CO1.	recall various optimization techniques and algorithms to solve LPP, assignment problem, transportation problem, game theory problems and network problems.
CO2.	apply various methods to obtain optimum solution for LPP and game theory problems.
CO3.	compute optimum solution for transportation, assignment and network problems.
CO4.	examine critical path for the network, value of the game and optimum solution for LPP problems
CO5.	evaluate optimum solution for the real life problems involving project planning and game theory problems.

Core Course	
Course Code: HLMT31	**Course Title: THEORY OF FIELDS**
On successful completion of the course, the learners should be able to	
CO1.	explain various extension fields, its properties and various basic results in theory of Fields.
CO2.	describe the properties of G(K, F), its fixed field, field of rational functions and solvability by radicals of a polynomial
CO3.	apply the mathematical / logical argument for proving criterions and characterizations on numerous concepts of field theory, Galoi's Theory(Group).
CO4.	construct Splitting field and Galois group over rationals.
CO5.	examine the nature of finite fields.

Core Course	
Course Code: HLMT32	**Course Title: ADVANCED NUMERICAL METHODS**
On successful completion of the course, the learners should be able to	
CO1.	discuss the eigen values, eigen vectors, real and complex roots of the equation, missing data and solution for the differential equation.
CO2.	explain the various method for symmetric matrices.
CO3.	apply the piecewise and spline, bivariate to find accurate result.
CO4.	make use of the approximation find polynomial, trigonometric ,exponential functions.
CO5.	justify and evaluate the methods of solving differential equations.

Core Course	
Course Code: HLMT32L	**Course Title: ADVANCED NUMERICAL METHODS LAB**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts in C and C++ program.
CO2.	apply C language to solve the cubic equation.
CO3.	make use of the numerical solution of differential equation by Euler's method with its actual solution.
CO4.	examine the solution of second order differential equation by Range-Kutta method.
CO5.	develop C++ program to solve the second order differential equations.

Core Course	
Course Code: HLMT33	**Course Title: FUNCTIONAL ANALYSIS I**
On successful completion of the course, the learners should be able to	
CO1.	illustrate the ideas and some of the fundamental theorems on functional analysis.
CO2.	explain fundamental theorems to the theory of normed , banach and Hilbert spaces.
CO3.	apply the value of looking at the spectrum of a bounded linear operator and idea of duals.
CO4.	develop weak and weak* convergence.
CO5.	analyze the use of abstract algebraic/topological structures in studying spaces of functions.

Core Course	
Course Code: HLMT34	**Course Title: ADVANCED TOPOLOGY**
On successful completion of the course, the learners should be able to	
CO1.	outline the fundamental concepts of topological spaces.
CO2.	identify the properties of topological spaces.
CO3.	construct the mathematical arguments that relate to the study of topological spaces.
CO4.	analyze the behavior of topological spaces.
CO5.	examine the characteristics and equivalence criterions of various concepts of topological

Elective Course	
Course Code: HLMT3E1	**Course Title: CSIR UGC - NET Preparatory course - Mathematics**
On successful completion of the course, the learners should be able to	
CO1.	:recall the basic concepts of mathematics.
CO2.	apply various techniques to solve mathematical problems.
CO3.	Select appropriate methods for solving various types of problems.
CO4.	compare and conclude the solution to the applied mathematical problems.
CO5.	analyze the mathematical and computation skills of Topology, Algebra, Analysis, Numerical

Elective Course	
Course Code: HLMT3E2	**Course Title: –ADVANCED ANALYSIS**
On successful completion of the course, the learners should be able to	
CO1.	recall the basic concepts of linear transformation and Differentiation.
CO2.	apply differentiation and integration for functions of several variables.
CO3.	analyze the closed forms and exact forms.
CO4.	assess the theory of line integrals and its usage in the proof of the n-dimensional analogue of the fundamental theorem of calculus.
CO5.	develop the functions of several variables in Euclidean n-space R^n

Core Course	
Course Code: HLMT41	**Course Title: FUZZY ALGEBRA**
On successful completion of the course, the learners should be able to	
CO1.	identify the crisp sets and fuzzy sets.
CO2.	find the fuzzy relations and its projections.
CO3.	develop the arithmetic operations on fuzzy sets and the method of fuzzymorphisms.
CO4.	analyze the concepts of fuzzy sets in various algebraic structures.
CO5.	examine the fuzzy results in algebraic structures.

Core Course	
Course Code: HLMT42	**Course Title: COMPLEX ANALYSIS**
On successful completion of the course, the learners should be able to	
CO1.	explain analytic function, CR equations, radius of convergence, complex integration & numerous basic results in context of complex numbers.
CO2.	discuss the properties of transformations, analytic functions, sequences of analytic functions and power series expansions.
CO3.	apply mathematical / logical arguments for proving characterizations, criterions on many concepts
CO4.	compute the value of line integrals &finite integrals.
CO5.	examine the properties of meromorphic & entire functions.

Core Course	
Course Code: HLMT43	**Course Title: PROBABILITY AND STATISTICS**
On successful completion of the course, the learners should be able to	
CO1.	classify the properties of the distribution function.
CO2.	explain the theory of probability in various distributions.
CO3.	find probability density function in various distributions.
CO4.	examine the moment generating functions for various distributions.
CO5.	evaluate convergence in distributions using positive central limit theorem.

Elective Course	
Course Code: HLMT4E1	**Course Title: FUNCTIONAL ANALYSIS II**
On successful completion of the course, the learners should be able to	
CO1.	illustrate accurate and efficient use of functional analysis techniques.
CO2.	explain the fundamental properties of compact linear maps.
CO3.	apply projection and riesz representation theorems on Hilbert space.
CO4.	develop the generalization of bounded operator on hilbert space.
CO5.	analyze spectra of bounded / compact operators.

Elective Course	
Course Code: HLMT4E2	**Course Title: COMBINATORIAL MATHEMATICS**
On successful completion of the course, the learners should be able to	
CO1.	recall the fundamental concepts on Inclusion and Exclusion principles.
CO2.	apply the concept of Permutations and Combinations in real life problem.
CO3.	examine the concepts of Polya's counting and Generating functions.
CO4.	calculate Binomial coefficients and Generating Permutations.
CO5.	discuss on contact of networks and analysis of an activity network.

Major Course	
Course Code: HLMT4P	**Course Title: –PROJECT AND VIVA VOCE**
On successful completion of the course, the learners should be able to	
CO1.	illustrate the mathematical concepts in the area of specialization.
CO2.	develop analytic and research skills.
CO3.	analyze and extend any research paper in various branches of mathematics.
CO4.	choose area of interest for pursuing research.
CO5.	invent new ideas in emerging trends of mathematics

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC,
College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

DEPARTMENT OF MATHEMATICS

UG DEGREE PROGRAMME IN MATHEMATICS WITH COMPUTER APPLICATIONS

PROGRAMME EDUCATIONAL OBJECTIVES	
The Graduates will	
PEO1.	be excellent in teaching, programming skills and subject knowledge, take them to grow in education system and higher administrations like TNPSC, IPSC, LIC etc.,
PEO2.	construct mathematical models for real life problems and obtain solution by analytic approach.
PEO3.	explore critical thinking, programming skills in diverse areas of Mathematics and experience an environment conducive in cultivating skills for successful career entrepreneurship and higher studies.
PEO4.	perform professionally with social, cultural responsibility as an individual as well as in multifaceted teams with positive attitude.

PROGRAMME SPECIFIC OUTCOMES	
By the Completion of B.Sc Mathematics with Computer Applications programme, the learners will be able to	
PSO1.	apply the knowledge in pure, applied Mathematics and programming languages to solve mathematical problems.
PSO2.	provide optimistic solutions to social life problems by applying various Mathematical methods.
PSO3.	become in-depth, motivated researchers in a specific area of study with the ability to recognize and address important scientific problems.
PSO4.	communicate effectively about the different concepts of Mathematics in various disciplines.
PSO5.	collaborate effectively in a team to solve social and real life problems.
PSO6.	apply ethical principles and be committed to professional ethics & social responsibilities.
PSO7.	apply the mathematical concepts in all the fields of learning including research and recognize the need and prepare for life-long learning.

COURSE OUTCOME

Core Course	
Course Code: GLMC11	**Course Title: CALCULUS AND TRIGONOMETRY**
On successful completion of the course, the learners should be able to	
CO1.	explain the basic concepts of differentiation, integration, hyperbolic function and trigonometric series
CO2.	estimate the solution for the problems in calculus, hyperbolic function and trigonometric series.
CO3.	determine the area and volume of the surfaces.
CO4.	calculate the solution to the problems in Calculus and Trigonometry
CO5.	simplify the problems in Calculus and Trigonometry.

Core Course	
Course Code: GLMC12	**Course Title: AG3D AND VECTOR CALCULUS**
On successful completion of the course, the learners should be able to	
CO1.	list the types of equations of planes and straight lines, spheres, list the formulas in vector algebra and Green's ,Gauss's and Stoke's theorems
CO2.	apply appropriate tools and techniques to solve problems in straight lines, planes and volume of surfaces.
CO3.	discuss the concept of planes and volume of surfaces ,spheres and solve problems in vector algebra.
CO4.	evaluate multiple integrals using Green's, Gauss's and Stoke's theorems .
CO5.	analyze the knowledge in solving problems on plane, line, sphere, and integrals, gradient curl, Green's, Gauss's and Stoke's theorems

Allied Course	
Course Code: GLMC1A	**Course Title: STATISTICS I**
On successful completion of the course, the learners should be able to	
CO1.	define the basic concepts of statistics.
CO2.	classify various moments and apply knowledge of statistics to solve real life problems
CO3.	explain the properties of central tendencies, moments, skewness, correlation, regression and attributes,
CO4.	evaluate index number by various methods.
CO5.	determine correlation and regression

Core Course	
Course Code: GLMC21	**Course Title: THEORY OF EQUATIONS**
On successful completion of the course, the learners should be able to	
CO1.	recall the fundamental concepts of different types of equations and its roots, nature and position.
CO2.	identify the relation between roots and coefficient, nature and position of roots.
CO3.	examine reciprocal, cubic and biquadratic equations for its roots.
CO4.	evaluate exact or approximate solution of any equations by applying various methods.
CO5.	develop knowledge in solving equations by using computer skill.

Core Course	
Course Code: GLMC22	**Course Title: NUMERICAL METHODS**
On successful completion of the course, the learners should be able to	
CO1:	define algebraic, transcendental, simultaneous equations, finite difference, forward, backward, central difference operators.
CO2:	apply various numerical methods to solve algebraic, transcendental, simultaneous equations.
CO3:	analyze data by using numerical differentiation, numerical integration and by interpolation.
CO4:	determine approximate solution for any type of equation by numerical iteration methods.
CO5:	develop knowledge in iterative methods to solve any real life problems.

Allied Course	
Course Code: GLMC2A	**Course Title: STATISTICS II**
On successful completion of the course, the learners should be able to	
CO1:	recall the basic concepts of probability and statistics.
CO2:	explain the nature of population through hypothesis.
CO3:	identify the concept of probability, random variables, sampling, and distribution.
CO4:	make use of computational skills to solve the real life problems using statistics.
CO5:	evaluate problems on probability, random variables, sampling, and distribution.

Allied Course	
Course Code: GLMC2AL	**Course Title: STATISTICS LAB**
On successful completion of the course, the learners should be able to	
CO1:	identify the basic concepts of R language
CO2:	apply t-Test and F-Test to test small and large samples
CO3:	analyze different measures of central tendencies
CO4:	evaluate correlation coefficient for any bivariate data
CO5:	develop the programming skill to solve real life problems

Core Course	
Course Code: GLMC31	**Course Title: MODERN ALGEBRA**
On successful completion of the course, the learners should be able to	
CO1:	list out the basic concepts in Groups, Rings and Fields.
CO2:	prove the properties and results in algebraic structure.
CO3:	apply the properties and results of groups to solve problems.
CO4:	examine the equivalence criterions and characteristics of groups and rings of various types.
CO5:	justify the statements in algebraic structure by giving proof or by giving example.

Core Course	
Course Code: GLMC32	**Course Title: DIFFERENTIAL EQUATIONS**
On successful completion of the course, the learners should be able to	
CO1:	explain the basic concepts of ODE and PDE.
CO2:	estimate the problems of ODE and PDE.
CO3:	apply various methods to solve differential equations.
CO4:	solve the ODE and simultaneous linear differential equations by using Laplace and inverse Laplace transforms.
CO5:	examine the different forms of ODE and PDE for finding the solutions.

Allied Course	
Course Code: GLMC3A	**Course Title: PROGRAMMING IN C**
On successful completion of the course, the learners should be able to	
CO1:	define the basic concepts of C Language.
CO2:	discuss user defined functions, structures, unions, pointers and files.
CO3:	apply decision making and looping statements to create simple programs
CO4:	build simple programs using functions, arrays and file.
CO5:	infer the concept of pointers, structures and unions.

Allied Course	
Course Code: GLMC3AL	**Course Title: PROGRAMMING IN C LAB**
On successful completion of the course, the learners should be able to	
CO1:	choose conditional control making statements to solve the problems.
CO2:	develop programming skills.
CO3:	analyze the concepts of functions and structures.
CO4:	deduct and rectify errors in programs.
CO5:	design programs for real life situation.

Elective Course	
Course Code: GLMC3N	**Course Title: NUMERICAL APTITUDE I**
On successful completion of the course, the learners should be able to	
CO1:	list the formulae to calculate H.C.F and L.C.M of Numbers, square roots and cube roots, average, ages percentage ,profit and loss, and ratio.proportion time and work ,time and distance
CO2:	build the problem solving skills on quantitative aptitude.
CO3:	compare and calculate H.C.F and L.C.M of Numbers, square roots and cube roots, average, ages percentage ,profit and loss, and ratio.proportion time and work ,time and distance.
CO4:	evaluate problems on H.C.F and L.C.M of Numbers, square roots and cube roots, average, ages percentage ,profit and loss, and ratio.proportion time and work ,time and distance.
CO5:	develop skills to attend the competitive exams confidently**.**

Core Course	
Course Code: GLMC41	**Course Title: GRAPH THEORY**
On successful completion of the course, the learners should be able to	
CO1:	explain the basic concepts of graph theory.
CO2:	discuss the properties of different types of graphs like Eulerian, Hamiltonian, bipartite, trees and planar graphs.
CO3:	apply logical argument / algorithm for proving characterization, equivalence criterions on various concepts of graph theory.
CO4:	identify the properties of vertex colouring and edge colouring in graphs
CO5:	analyze the behavior of various kinds of graphs.

Core Course	
Course Code: GLMC42	**Course Title: SEQUENCES AND SERIES**
On successful completion of the course, the learners should be able to	
CO1:	CO1: explain the basic concepts of sequences and series.
CO2:	discuss the properties of different types of sequences like convergent, divergent and oscillating sequences.
CO3:	apply logical argument for proving characterization, equivalence criterions on various concepts of sequences and series.
CO4:	identify the nature of sequences and series.
CO5:	analyze the behavior of series by applying various tests.

Allied Course	
Course Code: GLMC4A	**Course Title: PROGRAMMING IN C++**
On successful completion of the course, the learners should be able to	
CO1:	explain the principles of OOP and distinguish classes and objects.
CO2:	develop knowledge on constructors and destructors.
CO3:	analyze characteristics of an object-oriented programming language.
CO4:	compare the types of inheritance.
CO5:	create program using concept OOP.

Allied Course	
Course Code: GLMC4AL	**Course Title: PROGRAMMING IN C++ LAB**
On successful completion of the course, the learners should be able to	
CO1:	define the basic concepts of OOPs.
CO2:	develop programs using constructor and destructor.
CO3:	distinguish operator overloading and function overloading.
CO4:	deduct and rectify the errors in programs.
CO5:	improve programming skills.

Elective Course	
Course Code: GLMC4N	**Course Title: NUMERICAL APTITUDE II**
On successful completion of the course, the learners should be able to	
CO1:	recall the basic formulae in mathematics.
CO2:	develop problem solving skill in numerical aptitude.
CO3:	analyze and solve analytical problems.
CO4:	evaluate problems on arithmetic.
CO5:	improve problem solving skills and attend the competitive exams confidently**.**

DISCIPLINE SPECIFIC COURSE	
Course Code: GLMC4DS	**Course Title: COMBINATORICS**
On successful completion of the course, the learners should be able to	
CO1:	explain the rules of sum and product of permutations and combinations.
CO2:	apply counting principles to find solution to real life problems.
CO3:	analyze inclusion and exclusion principle.
CO4:	evaluate solutions by the technique of generating functions.
CO5:	develop problem solving skills.

Core Course		
Course Code: GLMC51		**Course Title: REAL ANALYSIS**
On successful completion of the course, the learners should be able to		
CO1:	explain the basic concepts of metric spaces and their properties.	
CO2:	discuss open, closed, complete, continuity, connected compact sets and convergent function defined on metric spaces.	
CO3:	apply the properties of open sets, closed sets, complete, continuity, discontinuity and uniform continuity, connectedness with continuity, compactness with continuity.	
CO4:	identify the behaviour of complete metric space.	
CO5:	analyze the characteristics and equivalence criterions of various concepts of real line.	

Core Course		
Course Code: GLMC52		**Course Title: LINEAR ALGEBRA**
On successful completion of the course, the learners should be able to		
CO1:	define vector spaces, product spaces and theory of matrices.	
CO2:	solve system of simultaneous linear equations and computing eigen values ,eigen vectors.	
CO3:	develop knowledge on vector spaces and inner product spaces and matrices	
CO4:	apply the concepts of basis, dimension of vector spaces, inner product spaces and matrices to Solve problems.	
CO5:	analyze the characteristics of vector spaces, inner product spaces and matrices.	

Elective Course	
Course Code: GLMC5E1	**Course Title: LINEAR PROGRAMMING**
On successful completion of the course, the learners should be able to	
CO1:	explain LPP, canonical & standard form, primal-dual form and sub / special classes of LPP.
CO2:	express real life problem into mathematical form.
CO3:	apply efficient computational techniques and algorithms that are needed to solve optimization problems, sub / special classes of LPP.
CO4:	determine basic, feasible, infeasible, IBFS, unbounded, degenerate/non degenerate solutions to a LPP, TP and AP.
CO5:	examine the balanced / unbalanced TP / AP.

Elective Course	
Course Code: GLMC5E2	**Course Title: FOURIER ANALYSIS**
On successful completion of the course, the learners should be able to	
CO1:	define the expansion of periodic functions.
CO2:	construct Fourier series for any function.
CO3:	analyze the applications of Fourier integrals formula.
CO4:	evaluate the Fourier sine and cosine transform.
CO5:	construct the finite Fourier sine cosine transform.

Elective Course	
Course Code: GLMC5E3	**Course Title: DISCRETE MATHEMATICS**
On successful completion of the course, the learners should be able to	
CO1:	classify the basic principles of discrete Mathematical structures.
CO2:	explain the truth table for Tautology.
CO3:	apply the concept of Boolean algebra and its application in Karnaugh Map and switching circuits.
CO4:	compute finite automation for strings.
CO5:	justify and evalute the types of Grammars and generate them for Languages.

Elective Course	
Course Code: GLMC5E4	**Course Title: MODERN APPLIED ALGEBRA**
On successful completion of the course, the learners should be able to	
CO1:	define algebraic systems, Boolean algebra and lattice.
CO2:	apply Modern Algebra to data communication.
CO3:	analyze the concepts of coding and decoding digital informations.
CO4:	explain modular and geometric lattices.
CO5:	construct polynomial codes.

Core Course	
Course Code: GLMC5L	**Course Title: Maple Lab**
On successful completion of the course, the learners should be able to	
CO1:	list the technical codings for efficient usage of Maple software.
CO2:	identify the techniques of the mathematical software to solve real life problems.
CO3:	analyze the codings to find eigen values and inverse of any square matrix.
CO4:	determine the values of trigonometric and algebraic functions.
CO5:	develop programming skill in solving differential equation.

Core Course	
Course Code: GLMC61	**Course Title: COMPLEX ANALYSIS**
On successful completion of the course, the learners should be able to	
CO1:	explain the fundamental concepts of complex numbers.
CO2:	discuss the properties of various types of transformations, and expanded power series, integrations and residues.
CO3:	solve problems in complex numbers.
CO4:	identify the behaviour of conformal mapping and transformations.
CO5:	analyze the characteristics and equivalence criterions of various concepts of complex numbers.

Core Course	
Course Code: GLMC62	**Course Title: NUMBER THEORY**
On successful completion of the course, the learners should be able to	
CO1:	explain g.c.d, l.c.m and several basic results on Number theory.
CO2:	describe the properties of congruences and primitive roots .
CO3:	apply effective computational techniques / mathematical arguments for proving characterization, criterions on different concepts of Number theory.
CO4:	solve various types of problems / congruences in context of theory of numbers using mathematical calculations/various familiar theorems.
CO5:	examine the properties of prime numbers and number theoretic functions.

Elective Course	
Course Code: GLMC6E1	**Course Title: OPERATIONS RESEARCH**
On successful completion of the course, the learners should be able to	
CO1:	explain the concepts of game theory, queueing theory, replacement policy.
CO2:	discuss various models in replacement policy, queueing theory.
CO3:	apply efficient computational techniques that are needed to solve optimization Problems in game theory , queueing theory, replacement policies.
CO4:	examine the techniques and solve problems on queueing theory, inventory control..
CO5:	evaluate problems in sequencing, inventory control.

Elective Course	
Course Code: GLMC6E2	**Course Title: APPLIED STATISTICS**
On successful completion of the course, the learners should be able to	
CO1:	define the concept of scalling of scores and reliability of test scores.
CO2:	develop knowledge in vital statistics.
CO3:	analyze the Z-Score and Z-Scale.
CO4:	compute the measurement of mortality.
CO5:	construct mortality table.

Elective Course	
Course Code: GLMC6E3	**Course Title: AUTOMATA AND FORMAL LANGUAGES**
On successful completion of the course, the learners should be able to	
CO1:	construct basic knowledge in automation and phrase structure grammars.
CO2:	apply the concepts in theoretical computer science.
CO3:	construct derivation trees.
CO4:	explain regular languages.
CO5:	build content free grammars languages.

Core Course	
Course Code: GLMC6P	**Course Title: Project**
On successful completion of the course, the learners should be able to	
CO1:	relate computational skills to mathematical concept.
CO2:	apply programming skills to solve real life problems.
CO3:	analyze the strength and weakness of team work.
CO4:	explain the concept in the area of specialization.
CO5:	improve various skills for further development in higher studies.

Core Course	
Course Code: GLMC6L	**Course Title: MATLAB**
On successful completion of the course, the learners should be able to	
CO1:	explain the codings in MATLAB.
CO2:	apply MATLAB for solving Mathematical problems.
CO3:	analyze the roots of the equation and trace the curve.
CO4:	evaluate optimal solution of LPP by using MATLAB.
CO5:	compile and discuss regression lines.

JOB ORIENTED COURSE	
Course Code: GLJO70	**Course Title: MATHEMATICAL STATISTICS**
On successful completion of the course, the learners should be able to	
CO1:	recall the basic concepts of statistics.
CO2:	explain correlation coefficient and form regression lines for any bivariate data.
CO3:	apply statistical techniques to solve real life problems.
CO4:	analyze various statistical parameters.
CO5:	estimate a line of best fit.

JOB ORIENTED COURSE	
Course Code: GLJO70L	**Course Title: - MATHEMATICAL STATISTICS LAB**
On successful completion of the course, the learners should be able to	
CO1:	recall the fundamentals of SPSS package.
CO2:	apply SPSS packages to find solutions for various statistical parameters.
CO3:	analyze the bivariate data and form regression lines.
CO4:	compare various types of charts.
CO5:	improve statistical skills to solve problems in various disciplines.