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# 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		
DCO1	impart knowledge on the basics of core branches of Mathematics like Algebra, Analysis,	
PSO1.	Calculus, Vector Algebra, Trigonometry and Number theory.	
PSO2.	formulate, convert in to mathematical modelling and apply mathematical techniques to	
P302.	solve problems in science and various disciplines.	
DSO2	analyse mathematical theorems and apply the concepts to arrive at solutions for real life	
PSO3.	mathematical problems.	
	communicate effectively about Mathematics to both layman and expert audiences	
PSO4.	utilizing appropriate information and communication technology.	
PSO5.	work independently and collaborate effectively in team to achieve their goal.	
1505.	work independently and conductate effectively in team to demove their gout.	
PSO6.	recognize the importance of adhering to science and its ethical values and become a	
1500.	responsible citizen.	
PSO7.	conduct self evaluation and continuously enrich themselves through life-long learning.	

## **COURSE OUTCOME**

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Core Course		
Course Code: GLMT11		Course Title: CALCULUS AND TRIGONOMETRY
	On successful completion of the co	ourse, 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.	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.		ts of roots, coefficients, nature and position ratic and reciprocal equations.
CO2.		ots and coefficients to find sum of the powers of the ons and to transform the equation whose roots are
CO3.	compute nature and position of r biquadratic equations.	roots of the equation and to solve cubic and
CO4.	analyze the equation for the exis position	tence of real and imaginary roots and its nature and
	estimate exact or approximate solution for any numerical equations	
CO5.		olution for any numerical equations re Course Course Title: NUMERICAL METHODS
CO5.	Co Course Code: GLMT22	re Course Course Title: NUMERICAL METHODS
CO5.	Course Code: GLMT22 On successful completion of the define algebraic, transcendental,	re Course Course Title: NUMERICAL METHODS course, the learners should be able to simultaneous equations, finite difference, forward,
	Course Code: GLMT22 On successful completion of the define algebraic, transcendental, backward, central difference ope	re Course Course Title: NUMERICAL METHODS course, the learners should be able to simultaneous equations, finite difference, forward
C01.	Course Code: GLMT22 On successful completion of the define algebraic, transcendental, backward, central difference ope apply various numerical method equations.	re Course Course Title: NUMERICAL METHODS course, the learners should be able to simultaneous equations, finite difference, forward erators. s to solve algebraic, transcendental, simultaneous olation techniques and estimate differentiation and
CO1. CO2.	Course Code: GLMT22 Con successful completion of the define algebraic, transcendental, backward, central difference ope apply various numerical method equations. compute missing data by interpo- integration by numerical method	re Course Course Title: NUMERICAL METHODS e course, the learners should be able to simultaneous equations, finite difference, forward, erators. s to solve algebraic, transcendental, simultaneous olation techniques and estimate differentiation and

Core Course		
Course Code: GLMT22 Course Title: NUMERICAL METHOD		Course Title: NUMERICAL METHODS
On successful completion of the course, the learners should be able to		
CO1.	define algebraic, transcendental, sin backward, central difference operate	nultaneous equations, finite difference, forward, ors.
CO2.	apply various numerical methods to solve algebraic, transcendental, simultaneous equations.	
CO3.	<b>CO3.</b> 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 methods.	any type of equation by numerical iteration

Core Course		
	Course Code: GLMT31	Course Title: MODERN ALGEBRA
	On successful completion of the	he course, the learners should be able to
CO1.	list out the basic concepts in G	roups, 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 criter various types.	ions and characteristics of groups and rings of
CO5.	justify the statements in algebraic structure by giving proof or by giving example.	

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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.	
СО3.	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	
СО3.	<b>CO3.</b> solve different types of ODE and PDE by applying differentiation and Laplace transform techniques	
CO4.	<b>CO4.</b> estimate solution for science discipline problems by applying differential equation concepts.	
CO5.	analyze differential equations for pr	ractical oriented problems.

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Allied Course			
(	Course Code: GLMT3ACourse Title: PROGRAMMING IN C		
On successful completion of the course, the learners should be able to			
C01.	define the basic concepts of C Lang	uage.	
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 situati	on.	

Elective Course			
	Course Code: GLMT3NCourse 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.	CO3. compute various measures of dispersion.		
CO4.	explain correlation analysis.		
CO5.	develop computational skills.		

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Core Course			
	Course Code: GLMT41     Course Title: GRAPH THEORY		
On successful completion of the course, the learners should be able to			
C01.	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 kin	ds 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 ap	pplying various tests.	

	All	lied Cour	se
(	Course Code: GLMT4A1	Cou	urse Title: ALLIED MATHEMATICS II
On succes	sful completion of the course, th	ne learnei	rs should be able to
CO1.	explain the basic concepts in structure.	n vector	calculus, finite differences and algebraid
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	l missing o	lata by interpolation.
	All	lied Cour	se
		urse Title: PROGRAMMING IN C++	
On succes	sful completion of the course, th	he learner	s should be able to
CO1.	explain the principles of OOP a	and distin	guish classes and objects.x
CO2.	develop knowledge on construct	ctors and	destructors.
СО3.	analyze characteristics of an ob	bject-orier	ited programming language.
<b>CO4.</b>	compare the types of inheritance.		
CO5.	create program using concept OOP.		
	All	lied Cour	'SP
	Course Code: GLMT4AL		urse Title: PROGRAMMING IN C++
On succes	sful completion of the course, th	ne learnei	s should be able to
CO1.	define the basic concepts of OC	OPs.	
CO2.	develop programs using constr	ructor and	destructor.
СО3.	distinguish operator overloadin	ng and fun	ction overloading.
CO4.	deduct and rectify the errors in	programs	3
CO5.	improve programming skills.		

Allied Course		
(	Course Code: GLMT4A	Course Title: PROGRAMMING IN C++
On successful completion of the course, the learners should be able to		
C01.	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			
C	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			
C	Course Code: GLMT4DSCourse 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				
C01.	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 sol	lving problems		

	Discipli	ine Specific Course	
	Course Code: GLMT4DS	Course Title: COMBINATORICS	
)n succes	ssful 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.		
соз.	analyze inclusion and exclusi	on principle.	
CO4.	evaluate solutions by the tech	nnique of generating functions.	
CO5.	develop problem solving skil	ls.	
	F	lective Course	
	Course Code: GLMT4N	Course Title: NUMERICAL METHODS	
		the course, the learners should be able to	
<b>CO1.</b>	define algebraic and transcen		
<b>CO2.</b>	apply various methods to solv	-	
CO3.	analyze various finite differen	-	
CO4.	determine the missing data using finite differences.		
CO5.	improve computational skills in solving problems		
		Cone Course	
		Core Course	
	Course Code: GLMT51	Course Title: REAL ANALYSIS	
	Course Code: GLMT51	Course Title: REAL ANALYSIS the learners should be able to	
CO1.	Course Code: GLMT51 ssful completion of the course, explain the basic concepts of	Course Title: REAL ANALYSIS         the learners should be able to         metric spaces and their properties.	
CO1. CO2.	Course Code: GLMT51 ssful completion of the course, explain the basic concepts of discuss open, closed, complet convergent function defined	Course Title: REAL ANALYSIS         the learners should be able to         metric spaces and their properties.         te, continuity, connected compact sets and on metric spaces.	
CO1.	Course Code: GLMT51 ssful completion of the course, explain the basic concepts of discuss open, closed, complet convergent function defined apply the properties of open s and uniform continuity, conr	Course Title: REAL ANALYSIS         the learners should be able to         metric spaces and their properties.         te, continuity, connected compact sets and	
CO1. CO2.	Course Code: GLMT51 ssful completion of the course, explain the basic concepts of discuss open, closed, complet convergent function defined apply the properties of open s	Course Title: REAL ANALYSIS the learners should be able to metric spaces and their properties. te, continuity, connected compact sets and on metric spaces. sets, closed sets, complete, continuity, discontinuity nectedness with continuity, compactness with	

Core Course			
	Course Code: GLMT52Course 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	r 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			
C01.	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 solvin	ng differential equation.	

Elective Course			
С	ourse Code: GLMT5E1	Course Title: LINEAR PROGRAMMING	
On successful completion of the course, the learners should be able to			
C01.	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			
C	Course Code: GLMT5E2     Course Title: FOURIER ANALYSIS		
On successful completion of the course, the learners should be able to			
C01.	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.		

	Ele	ective Course
(	Course Code: GLMT5E2	Course Title: FOURIER ANALYSIS
On succes	sful completion of the course, tl	he learners should be able to
CO1.	define the expansion of period	lic functions.
CO2.	construct Fourier series for any	y function.
CO3.	analyze the applications of Fou	urier integrals formula.
CO4.	evaluate the Fourier sine and c	cosine transform.
CO5.	construct the finite Fourier sine	e cosine transform.
		ective Course
	Course Code: GLMT5E3	Course Title: DISCRETE MATHEMATICS
	sful completion of the course, the	
CO1.		f discrete Mathematical structures.
CO2.	explain the truth table for Taut	
CO3.	switching circuits	algebra and its application in Karnaugh Map and
CO4.	compute finite automation for	strings.
CO5.	justify and evalute the types of Grammars and generate them for Languages.	
		ective Course
	Course Code: GLMT5E4	Course Title: MODERN APPLIED ALGEBRA
On succes	sful completion of the course, tl	he learners should be able to
CO1.	define algebraic systems, Bool	lean algebra and lattice.
CO2.	apply Modern Algebra to data	a communication.
CO3.	analyze the concepts of coding and decoding digital information.	
CO4.	explain modular and geometric lattices.	
CO5.	construct polynomial codes.	

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 succes	sful completion of the course, t	he learners should be able to	
CO1.	explain the fundamental conce	epts of complex numbers.	
CO2.		us types of transformations, and expanded power	
СО3.	series, integrations and resid           solve problems in complex nu		
CO4.	identify the behaviour of conf	formal mapping and transformations.	
CO5.	analyze the characteristics and complex numbers	l equivalence criterions of various concepts of	
		Core Course	
	Course Code: GLMT62	Course Title: NUMBER THEORY	
	sful completion of the course, t		
CO1.		al basic results on Number theory.	
CO2.	describe the properties of con		
CO3.	apply effective computational techniques / mathematical arguments for proving characterization, criterions on different concepts of Number theory.		
CO4.	solve various types of problem using mathematical calculatio	ns / congruences in context of theory of numbers ns/various familiar theorems.	
CO5.	examine the properties of prime numbers and number theoretic functions.		
	(	Core Course	
	Course Code: GLMT63	Course Title: STATISTICS	
On succes	sful completion of the course, t	he learners should be able to	
C01.	classify the properties of correction distributions.	elation, regression, index number and various	
	explain the concept of index numbers and various distributions .		
CO2.	develop sampling techniques small and large sampling .		
CO2. CO3.	develop sampling techniques	apply the hypothesis by applying t, F and $\chi^2$ test.	
		ing t, F and $\chi^2$ test.	

	Core Course		
(	Course Code: GLMT62Course Title: NUMBER THEORY		
On success	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.		
<b>CO4.</b>	solve various types of problems / congruences in context of theory of numbers using mathematical calculations/various familiar theorems.		
CO5.	examine the properties of prime nu	mbers 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 .		
<b>CO4.</b>	apply the hypothesis by applying t, F and $\chi^2$ 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			
C01.	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 line	s.	

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Elective Course			
С	Course Code: GLMT6E1Course 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, ir	iventory control.	

Elective Course			
С	Course Code: GLMT6E2Course Title: APPLIED STATISTICS		
On successful completion of the course, the learners should be able to			
C01.	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 FORMA         LANGUAGES		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.	

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Job oriented Course			
	Course Code: GLJ066Course 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		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: AMTEC1Course 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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## THE STANDARD FIREWORKS RAJARATNAM COL LEGE 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**

#### 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	
FLOI.	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**

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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.			

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: HLMT13Course 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.	CO3. solve constrained and unconstrained problems through optimization			
CO4.	O4. analyze shortest route, CPM and maximal flow problems by Linear Programming Formation.			
CO5.	estimate time schedule for the proje critical activities.	ect network by investigating critical and non-		

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.	CO2. apply TORA tools to solve network problems.			
CO3.	CO3. analyze time schedule by PERT and CPM method			
CO4.	determine the solution for the network models by using EXCEL spread sheet			
CO5.	D5. discuss the solving techniques of non-linear programming problems			

CO1. CO2.	Course Code: HLMT13L	Course Title: OPERATIONS RESEARCH- LAB
CO2.	On successful completion of the as	
CO2.	On successful completion of the Co	ourse, the learners should be able to
	recall the basic concepts of network	k theory and non linear programming.
	apply TORA tools to solve network	k problems.
CO3.	analyze time schedule by PERT and	1
CO4.		ork models by using EXCEL spread sheet
<u>CO5.</u>	discuss the solving techniques of no	on-mear programming problems
	Core	Course
	Course Code: HLMT14	Course Title: DIFFERENTIAL
	On successful completion of the co	EQUATIONS           ourse, the learners should be able to
CO1.	explain the fundamental concepts and methods of solving linear & non linear	
	differential equations	
<u>CO2.</u>		egender, Euler and Bessel equations.
CO3.	make use of computation skills to find solution of linear and nonlinear differential	
CO4.	equations.         examine the properties and conditions for the existence of the solutions of	
CO5.		d nonlinear partial differential equations by using
	various	
	Elective	e Course
(	Course Code: HLMT1E1	Course Title: MATHEMATICAL MODELLING
	On successful completion of the co	ourse, 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: 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 field equations	s and find solution using ODE and difference

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.	2. identify Mobius function and Euler totient function		
CO3.	O3. solve the problems on number theory.		
CO4.	apply mathematical/ induction arguments for proving criterions.		
CO5.	examine properties of congruences.		

	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 conce	epts of Number theory
CO2.	identify Mobius function and	Euler totient function
$\overline{\text{CO3.}}$	solve the problems on number	
CO4.		n arguments for proving criterions.
<u>CO5.</u>	examine properties of congru	ences.
		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.	
	discuss the various canonical	
CO2.		
CO3. CO4.		transformation for any matrix.
1 1 1 2	identify the behaviour of trace, transpose, determinants.	
CO5.	-	d equivalence criterions of various transformations.
	analyze the characteristics and	equivalence criterions of various transformations.
	analyze the characteristics and	d equivalence criterions of various transformations.
	analyze the characteristics and	equivalence criterions of various transformations.
	analyze the characteristics and Course Code: HLMT22	d equivalence criterions of various transformations.
	analyze the characteristics and Course Code: HLMT22	d equivalence criterions of various transformations. Core Course Course Title: ANALYSIS II
CO5.	analyze the characteristics and         analyze the characteristics and         Course Code: HLMT22         On successful completion of the second part	I equivalence criterions of various transformations.         Core Course         Course Title: ANALYSIS II         the course, the learners should be able to         integration, differentiation and measurable set.
CO5. CO1. CO2.	analyze the characteristics and Course Code: HLMT22	d equivalence criterions of various transformations.
CO5. CO1. CO2. CO3.	analyze the characteristics and         analyze the characteristics and         Course Code: HLMT22         On successful completion of the second process of         explain the basic concepts of         discuss the behaviour of funct	I equivalence criterions of various transformations.         Core Course         Course Title: ANALYSIS II         the course, the learners should be able to         integration, differentiation and measurable set.         ions of real line.         ed on subsets of real line.
CO5.	analyze the characteristics and         analyze the characteristics and         Course Code: HLMT22         On successful completion of the         explain the basic concepts of         discuss the behaviour of funct         apply various functions define         identify the behaviour of seque	I equivalence criterions of various transformations.         Core Course         Course Title: ANALYSIS II         the course, the learners should be able to         integration, differentiation and measurable set.         ions of real line.         ed on subsets of real line.

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.	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		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 co	ourse, the learners should be able to
CO1.	Explain the fundamental concepts of	of graph theory
CO2.	Identify the properties of Euler tou and domination.	r, Hamilton cycles, matching, chromatic number
CO3.	Apply graph theoretic knowledge in	n real life situations.
CO4.	nalyze the behavior of various kind	ls of graphs.
CO5.		ving characterization, equivalence criterions on ing, chromatic number and domination.

	Cor	e 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 topo	ological spaces
CO2.	identify various types of topologi	ical spaces
CO3.		nents that relate to the study of topological spaces.
CO4.		ous function in compact and connected spaces
CO5.	examine the characteristics and topological	d equivalence criterions of various concepts o
	Cor	e 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	s of graph theory
CO2.	Identify the properties of Euler to and domination.	our, Hamilton cycles, matching, chromatic numbe
CO3.	Apply graph theoretic knowledge	e in real life situations.
CO4.	nalyze the behavior of various ki	inds of graphs.
CO5.	explain logical argument for pr Euler tour, Hamilton cycles, mate	roving characterization, equivalence criterions of ching, chromatic number and domination.
	Electi	ive Course
		ive Course Course Title: QUANTITATIVE
	Course Code: HLMT2E	Course Title: QUANTITATIVE TECHNIQUES
	Course Code: HLMT2E On successful completion of the	Course Title: QUANTITATIVE TECHNIQUES course, the learners should be able to
C01.	Course Code: HLMT2E On successful completion of the recall various optimization techni problem, transportation problem,	Course Title: QUANTITATIVE TECHNIQUES course, the learners should be able to iques and algorithms to solve LPP, assignment game theory problems and network problems.
CO1. CO2.	Course Code: HLMT2E On successful completion of the recall various optimization techni problem, transportation problem, apply various methods to obtain problems.	Course Title: QUANTITATIVE TECHNIQUES course, the learners should be able to iques and algorithms to solve LPP, assignment game theory problems and network problems. optimum solution for LPP and game theory
CO2. CO3.	Course Code: HLMT2E         On successful completion of the       recall various optimization technic         problem, transportation problem, transportation problem, transportation problem, apply various methods to obtain problems.       compute optimum solution for transportation for transportati	Course Title: QUANTITATIVE TECHNIQUES course, the learners should be able to iques and algorithms to solve LPP, assignment game theory problems and network problems. optimum solution for LPP and game theory
CO2.	Course Code: HLMT2E On successful completion of the recall various optimization technic problem, transportation problem, apply various methods to obtain problems. compute optimum solution for tra- examine critical path for the network LPP problems	Course Title: QUANTITATIVE TECHNIQUES course, the learners should be able to iques and algorithms to solve LPP, assignment game theory problems and network problems. optimum solution for LPP and game theory

	Core	Course
	Course Code: HLMT31	Course Title: THEORY OF FIELDS
	On successful completion of the co	ourse, the learners should be able to
CO1.	explain various extension fields, its Fields.	s properties and various basic results in theory of
CO2.	describe the properties of G(K, F), solvability by radicals of a polynom	, its fixed field, field of rational functions and nial
CO3.	apply the mathematical / logical ar	
CO4.	construct Splitting field and Galois	
CO5.	examine the nature of finite fields.	
	Course Code: HLMT32	Course Title: ADVANCED NUMERICAL METHODS
	On successful completion of the co	ourse, the learners should be able to
CO1.	discuss the eigen values, eigen vec missing data and solution for the d	ctors, real and complex roots of the equation, lifferential equation.
000	avalain the verieus method for a	
CO2.	explain the various method for sy	
CO3.	apply the piecewise and spline, bi	variate to find accurate result.
	apply the piecewise and spline, bi	variate to find accurate result. Id polynomial, trigonometric ,exponential
CO3. CO4.	<ul> <li>apply the piecewise and spline, bive make use of the approximation fine functions.</li> <li>justify and evaluate the methods or provide the methods.</li> </ul>	variate to find accurate result. Id polynomial, trigonometric ,exponential f solving differential equations.
CO3. CO4.	<ul> <li>apply the piecewise and spline, bive make use of the approximation fine functions.</li> <li>justify and evaluate the methods on the methods of the</li></ul>	variate to find accurate result. Id polynomial, trigonometric ,exponential f solving differential equations. Course
CO3. CO4.	apply the piecewise and spline, bive make use of the approximation fine functions. justify and evaluate the methods on Core Course Code: HLMT32L	variate to find accurate result. Id polynomial, trigonometric ,exponential f solving differential equations. Course Course Title: ADVANCED NUMERICAI METHODS LAB
CO3. CO4. CO5.	apply the piecewise and spline, bive make use of the approximation fine functions. justify and evaluate the methods on Core of Course Code: HLMT32L On successful completion of the completion o	variate to find accurate result. Id polynomial, trigonometric ,exponential f solving differential equations. Course Course Course Title: ADVANCED NUMERICAI METHODS LAB ourse, the learners should be able to
CO3. CO4. CO5.	apply the piecewise and spline, bive make use of the approximation fine functions.         justify and evaluate the methods or correct the methods of the approximation functions.         Course Code: HLMT32L         On successful completion of the constraint of the basic concepts in C and the basic concepts in C	variate to find accurate result. Id polynomial, trigonometric ,exponential f solving differential equations. Course Course Course Title: ADVANCED NUMERICAI METHODS LAB ourse, the learners should be able to 1 C++ program.
CO3. CO4. CO5. CO1. CO2.	apply the piecewise and spline, bive make use of the approximation fine functions.         justify and evaluate the methods or justify and evaluate the methods or core of the co	variate to find accurate result. Id polynomial, trigonometric ,exponential f solving differential equations. Course Course Course Title: ADVANCED NUMERICAI METHODS LAB ourse, the learners should be able to d C++ program. c equation.
CO3. CO4. CO5. CO1. CO1. CO2. CO3.	apply the piecewise and spline, bive make use of the approximation fine functions.         justify and evaluate the methods or justify and evaluate the methods or core of the splain the basic concepts in C and apply C language to solve the cubic make use of the numerical solution its actual solution.	variate to find accurate result. Id polynomial, trigonometric ,exponential f solving differential equations. Course Course Course Title: ADVANCED NUMERICAI METHODS LAB ourse, the learners should be able to I C++ program. c equation. n of differential equation by Euler's method with a course and course an
CO3. CO4. CO5. CO1. CO2.	apply the piecewise and spline, bive make use of the approximation fine functions.         justify and evaluate the methods or justify and evaluate the methods or correct the methods.         Course Code: HLMT32L         On successful completion of the construction of the numerical solution its actual solution.         examine the solution of second ord	variate to find accurate result. Id polynomial, trigonometric ,exponential f solving differential equations. Course Course Course Title: ADVANCED NUMERICAI METHODS LAB ourse, the learners should be able to d C++ program. c equation.

	Core (	Course
	Course Code: HLMT32	Course Title: ADVANCED NUMERICAL METHODS
	On successful completion of the co	urse, the learners should be able to
CO1.	discuss the eigen values, eigen vec missing data and solution for the d	tors, real and complex roots of the equation, ifferential equation.
CO2.	explain the various method for sy	mmetric matrices.
CO3.	apply the piecewise and spline, biv	ariate to find accurate result.
CO4.	make use of the approximation find functions.	l polynomial, trigonometric ,exponential
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 co	ourse, 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 its actual solution.	of differential equation by Euler's method with
CO4.	examine the solution of second orde	er differential equation by Range-Kutta method.
CO5.	develop C++ program to solve the s	second order differential equations.

	Core	Course
	Course Code: HLMT33	Course Title: FUNCTIONAL ANALYSIS I
	On successful completion of the c	ourse, the learners should be able to
CO1.	illustrate the ideas and some of the	e fundamental theorems on functional analysis.
CO2.	explain fundamental theorems to the	he theory of normed, banach and Hilbert spaces
CO3.	apply the value of looking at the s duals.	pectrum of a bounded linear operator and idea o
CO4.	develop weak and weak* converge	
CO5.	analyze the use of abstract algebra functions.	ic/topological structures in studying spaces of
	Course Code: HLMT34	Course Title: ADVANCED TOPOLOGY
	On successful completion of the c	ourse, the learners should be able to
CO1.	outline the fundamental concepts of	
CO2. CO3.	identify the properties of topologi	cal spaces. ents that relate to the study of topological spaces
CO4.	analyze the behavior of topologica	
CO5.		equivalence criterions of various concepts of
	Electiv	e Course
	Course Code: HLMT3E1	Course Title: CSIR UGC - NET Preparatory course - Mathematics
	On successful completion of the c	ourse, the learners should be able to
		matica
CO1.	:recall the basic concepts of mathe	mattes.
CO1. CO2.	<ul><li>:recall the basic concepts of mathe</li><li>apply various techniques to solve r</li></ul>	
CO2. CO3.	apply various techniques to solve a           Select appropriate methods for solve	mathematical problems. lving various types of problems.
CO2.	apply various techniques to solve aSelect appropriate methods for solcompare and conclude the solution	mathematical problems.

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

	Elective	Course
(	Course Code: HLMT3E1	Course Title: CSIR UGC - NET Preparatory course - Mathematics
	On successful completion of the co	
CO1.	:recall the basic concepts of mathem	natics.
CO2.	apply various techniques to solve m	athematical problems.
CO3.	Select appropriate methods for solv	ving various types of problems.
CO4.	compare and conclude the solution	to the applied mathematical problems.
CO5.	analyze the mathematical and com Numerical	putation skills of Topology, Algebra, Analysis,

	Ele	ctive Course
	Course Code: HLMT3E2	Course Title: -ADVANCED ANALYSIS
	On successful completion of the	ne course, the learners should be able to
CO1.	recall the basic concepts of line	ear transformation and Differentiation.
CO2.	apply differentiation and integr	ration for functions of several variables.
CO3.	analyze the closed forms and ex	
CO4.	assess the theory of line integra analogue of the fundamental th	als and its usage in the proof of the n-dimensional
CO5.		ll variables in Euclidean n-space R <sup>n</sup>
	C	ore Course
	Course Code: HLMT41	Course Title: FUZZY ALGEBRA
	On successful completion of the	ne course, the learners should be able to
CO1.	identify the crisp sets and fuzz	zy sets.
<b>a</b> a <b>a</b>	find the fuzzy relations and its	projections
CO2.		projections.
<u>CO2.</u> CO3.	develop the arithmetic operation	ons on fuzzy sets and the method of
CO3.	develop the arithmetic operation fuzzymorphisms.	ons on fuzzy sets and the method of
	develop the arithmetic operation fuzzymorphisms.	ons on fuzzy sets and the method of sets in various algebraic structures.
CO3. CO4.	develop the arithmetic operation fuzzymorphisms. analyze the concepts of fuzzy s examine the fuzzy results in alg	ons on fuzzy sets and the method of sets in various algebraic structures. gebraic structures. ore Course
CO3. CO4.	develop the arithmetic operation fuzzymorphisms. analyze the concepts of fuzzy s examine the fuzzy results in alg	ons on fuzzy sets and the method of sets in various algebraic structures. gebraic structures.
CO3. CO4.	develop the arithmetic operation fuzzymorphisms. analyze the concepts of fuzzy s examine the fuzzy results in alg Course Code: HLMT42	ons on fuzzy sets and the method of sets in various algebraic structures. gebraic structures. ore Course
CO3. CO4.	develop the arithmetic operation fuzzymorphisms. analyze the concepts of fuzzy seats examine the fuzzy results in alge Course Code: HLMT42 On successful completion of the explain analytic function, CR explain analytic function functio	ons on fuzzy sets and the method of sets in various algebraic structures. gebraic structures. ore Course Course Course Title: COMPLEX ANALYSIS ne course, the learners should be able to equations, radius of convergence, complex
CO3. CO4. CO5.	develop the arithmetic operation fuzzymorphisms. analyze the concepts of fuzzy service examine the fuzzy results in alge Course Code: HLMT42 On successful completion of the explain analytic function, CR of integration & numerous basic re- discuss the properties of transfor	ore Course Course Course Title: COMPLEX ANALYSIS ne course, the learners should be able to equations, radius of convergence, complex results in context of complex numbers. ormations, analytic functions, sequences of analytic
CO3. CO4. CO5. CO1. CO2.	develop the arithmetic operation fuzzymorphisms. analyze the concepts of fuzzy search of the s	ore Course Course Course Course Course, the learners should be able to equations, radius of convergence, complex results in context of complex numbers. ormations, analytic functions, sequences of analytic pansions.
CO3. CO4. CO5.	develop the arithmetic operation fuzzymorphisms. analyze the concepts of fuzzy search of the s	ore Course Course Course Title: COMPLEX ANALYSIS ne course, the learners should be able to equations, radius of convergence, complex results in context of complex numbers. ormations, analytic functions, sequences of analytic
CO3. CO4. CO5. CO1. CO2.	develop the arithmetic operation fuzzymorphisms. analyze the concepts of fuzzy services examine the fuzzy results in algo examine the fuzzy results in algo Course Code: HLMT42 On successful completion of the explain analytic function, CR of integration & numerous basic r discuss the properties of transfor functions and power series ex- apply mathematical / logical and	ore Course Course Course Course Course Course Course, the learners should be able to equations, radius of convergence, complex results in context of complex numbers. ormations, analytic functions, sequences of analytic pansions. rguments for proving characterizations, criterions of grals &finite integrals.

	Core (	Course
	Course Code: HLMT41	Course Title: FUZZY ALGEBRA
	On successful completion of the co	urse, the learners should be able to
CO1.	identify the crisp sets and fuzzy set	is.
CO2.	find the fuzzy relations and its proje	ections.
CO3.	develop the arithmetic operations of fuzzymorphisms.	on fuzzy sets and the method of
CO4.	analyze the concepts of fuzzy sets	in various algebraic structures.
CO5.	examine the fuzzy results in algebra	aic structures.

	Core (	Course
	Course Code: HLMT42	Course Title: COMPLEX ANALYSIS
	On successful completion of the co	ourse, the learners should be able to
CO1.	1 2 7 1	tions, radius of convergence, complex
	integration & numerous basic result	ts in context of complex numbers.
CO2.	discuss the properties of transformation	tions, analytic functions, sequences of analytic
	functions and power series expans	ions.
CO3.	apply mathematical / logical argum	nents for proving characterizations, criterions on
	many concepts	
CO4.	compute the value of line integrals	&finite integrals.
CO5.	examine the properties of meromory	phic & entire functions.

	(	Core Course
	Course Code: HLMT43	Course Title: PROBABILITY AND STATISTICS
	On successful completion of t	he course, the learners should be able to
CO1.	classify the properties of the c	listribution function.
CO2.	explain the theory of probabil	ity in various distributions.
CO3.	find probability density functi	
CO4.	examine the moment generat	ing functions for various distributions.
CO5.	evaluate convergence in distri	butions using positive central limit theorem.
	Course Code: HLMT4E1	Course Title: FUNCTIONAL ANALYSIS
	On successful completion of t	he course, the learners should be able to
CO1.	illustrate accurate and efficient	t use of functional analysis techniques.
	illustrate accurate and efficient           explain the fundamental prope	
CO1. CO2. CO3.	explain the fundamental prope apply projection and riesz repr	rties of compact linear maps. resentation theorems on Hilbert space.
CO2.	explain the fundamental prope apply projection and riesz repr	rties of compact linear maps. resentation theorems on Hilbert space. pounded operator on hilbert space.
CO2. CO3. CO4.	explain the fundamental prope apply projection and riesz repr develop the generalization of b	rties of compact linear maps. resentation theorems on Hilbert space. pounded operator on hilbert space.
CO2. CO3. CO4.	explain the fundamental prope apply projection and riesz repr develop the generalization of b analyze spectra of bounded / c	rties of compact linear maps. resentation theorems on Hilbert space. pounded operator on hilbert space.
CO2. CO3. CO4.	explain the fundamental prope apply projection and riesz repr develop the generalization of b analyze spectra of bounded / c	rties of compact linear maps. resentation theorems on Hilbert space. pounded operator on hilbert space. compact operators.
CO2. CO3. CO4.	explain the fundamental prope apply projection and riesz repr develop the generalization of t analyze spectra of bounded / o Ele Course Code: HLMT4E2	ective Course Course Course Title: COMBINATORIAL
CO2. CO3. CO4.	explain the fundamental prope apply projection and riesz repr develop the generalization of t analyze spectra of bounded / o Ele Course Code: HLMT4E2 On successful completion of t	ective Course Course Title: COMBINATORIAL MATHEMATICS
CO2. CO3. CO4. CO5.	<ul> <li>explain the fundamental properation and riesz representation of the generalization of the general</li></ul>	rties of compact linear maps. resentation theorems on Hilbert space. resentation theorems on Hilbert space. resentation operators.
CO2. CO3. CO4. CO5. CO5.	<ul> <li>explain the fundamental proper apply projection and riesz representation of the generalization of the generalization of the analyze spectra of bounded / of analyze spectra of analyze spectra of bounded / of analyze spectra of</li></ul>	rties of compact linear maps. resentation theorems on Hilbert space. pounded operator on hilbert space. compact operators. rective Course Course Title: COMBINATORIAL MATHEMATICS he course, the learners should be able to ts on Inclusion and Exclusion principles. ions and Combinations in real life problem. a's counting and Generating functions.
CO2. CO3. CO4. CO5.	<ul> <li>explain the fundamental proper apply projection and riesz representation of the generalization of the generalization of the analyze spectra of bounded / of analyze spectra of analyze spectra of bounded / of analyze spectra of analy</li></ul>	rties of compact linear maps. resentation theorems on Hilbert space. resentation theorems on Hilbert space. resentation operators.

Elective Course		
Course Code: HLMT4E1     Course Title: FUNCTIONAL ANALYSIS I		
On successful completion of the course, the learners should be able to		
CO1.	illustrate accurate and efficient use of functional analysis techniques.	
CO2.	CO2. explain the fundamental properties of compact linear maps.	
CO3.	CO3. apply projection and riesz representation theorems on Hilbert space.	
CO4.	develop the generalization of bounded operator on hilbert space.	
CO5.	5. analyze spectra of bounded / compact operators.	

Elective Course		
Course Code: HLMT4E2 Course Title: COMB MATHEMATICS		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.	CO2. apply the concept of Permutations and Combinations in real life problem.	
CO3.	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		
C01.	illustrate the mathematical concepts in the area of specialization.	
CO2.	develop analytic and research skills.	
CO3.	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	

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#### 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<br>experience an environment conducive in cultivating skills for successful career<br>entrepreneurship and higher studies. |  |
| PEO4.              | perform professionally with social, cultural responsibility as an individual as well<br>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

| will be able t | $\circ$   |  |
|----------------|---|--|
| 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**

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| Core Course  |  |  |
|--|--|--|
| Course Code: GLMC11  |  | Course Title: CALCULUS AND<br>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.   | 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:<br>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            |  |

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| 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.   | CO4. evaluate index number by various methods.   |    |
| CO5.   | determine correlation and regressi   | on |

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| Core Course  |   |                                   |
|--|---|-----------------------------------|
| Course Code: GLMC21       Course Title: THEORY OF EQUATIONS            |   | 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.   | <sup>3.</sup> 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.                                     |                                   |

|   | Cor   | re Course  |  |
|---|---|--|--|
| Course Code: GLMC22 Course Title: NUMERICAL METHODS |   |  |  |
| On suc  | cessful completion of the course, the least   | rners should be able to  |  |
| CO1:  |   | multaneous equations, finite difference, forward   |  |
| CO2:  | backward, central difference operator<br>apply various numerical methods to so<br>equations.  | olve algebraic, transcendental, simultaneous   |  |
| CO3:  |   | l differentiation, numerical integration and b   |  |
| CO4:<br>CO5:  | determine approximate solution for an<br>develop knowledge in iterative metho   | type of equation by numerical iteration methods.   |  |
| Course  | Code: GLMC2A  | Course Title: STATISTICS II  |  |
| On suc  | cessful completion of the course, the lease   | rners should be able to  |  |
| CO1:  | recall the basic concepts of probability  | y and statistics.  |  |
| CO2:  | explain the nature of population through hypothesis.  |  |  |
|   | identify the concept of probability, random variables, sampling, and distribution.  |  |  |
| CO3:  | identify the concept of probability, fai  | make use of computational skills to solve the real life problems using statistics.   |  |
| CO3:<br>CO4:  |   |  |  |
|   | make use of computational skills to so  |  |  |
| CO4:  | make use of computational skills to so<br>evaluate problems on probability, rand  | olve the real life problems using statistics.  |  |
| CO4:<br>CO5:  | make use of computational skills to so<br>evaluate problems on probability, rand  | olve the real life problems using statistics.<br>dom variables, sampling, and distribution.  |  |
| CO4:<br>CO5:<br>Course                              | make use of computational skills to so<br>evaluate problems on probability, rand<br>Allie   | olve the real life problems using statistics.<br>dom variables, sampling, and distribution.<br>d Course<br>Course Title: STATISTICS LAB  |  |
| CO4:<br>CO5:<br>Course                              | make use of computational skills to so         evaluate problems on probability, rand         Allie         Code: GLMC2AL   | olve the real life problems using statistics.<br>dom variables, sampling, and distribution.<br>d Course<br>Course Title: STATISTICS LAB<br>rners should be able to   |  |
| CO4:<br>CO5:<br><b>Course</b><br>On suc             | make use of computational skills to so         evaluate problems on probability, rand         Allie         Code: GLMC2AL         cessful completion of the course, the lear  | olve the real life problems using statistics.<br>dom variables, sampling, and distribution.<br>d Course<br>Course Title: STATISTICS LAB<br>rners should be able to<br>tage                                   |  |
| CO4:<br>CO5:<br>Course<br>On suc<br>CO1:            | make use of computational skills to so         evaluate problems on probability, rand         Allied         Code: GLMC2AL         cessful completion of the course, the lead         identify the basic concepts of R language   | olve the real life problems using statistics.<br>dom variables, sampling, and distribution.<br>d Course<br>Course Title: STATISTICS LAB<br>rners should be able to<br>tage<br>nd large samples               |  |
| CO4:<br>CO5:<br>Course<br>On suc<br>CO1:<br>CO2:    | make use of computational skills to so         evaluate problems on probability, rand         Allie         Code: GLMC2AL         cessful completion of the course, the lear         identify the basic concepts of R language         apply t-Test and F-Test to test small at | olve the real life problems using statistics.<br>dom variables, sampling, and distribution.<br>d Course<br>Course Title: STATISTICS LAB<br>rners should be able to<br>tage<br>nd large samples<br>tendencies |  |

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

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|  | 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  | d PDE.                               |  |
| CO2:   | estimate the problems of ODE and PDE.  |                                      |  |
| CO3:   | apply various methods to solve differential equations.   |                                      |  |
| CO4:   | 4: solve the ODE and simultaneous linear differential equations by using Laplace and inverse Laplace transforms. |                                      |  |
| CO5:   | examine the different forms of ODE a   | nd PDE for finding the solutions.    |  |

|                                  | Allied Course                             |                                   |  |
|----------------------------------|---|-----------------------------------|--|
| Course Code: GLMC3A Course Title |   | Course Title: PROGRAMMING IN C    |  |
| On succ                          | essful completion of the course, the lear | mers should be able to            |  |
| CO1:                             | define the basic concepts of C Langua     | ge.                               |  |
| CO2:                             | discuss user defined functions, structu   | res, unions, pointers and files.  |  |
| CO3:                             | apply decision making and looping sta     | tements to create simple programs |  |
| CO4:                             | build simple programs using functions     | , arrays and file.                |  |
| CO5:                             | infer the concept of pointers, structure  | s and unions.                     |  |

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|   | Allied Course  |                                    |  |
|---|--|------------------------------------|--|
| Course Code: GLMC3AL Course Title: PROG |  | Course Title: PROGRAMMING IN C LAB |  |
| On succ                                 | 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.                               |                                    |  |

|        | Allie  | ed Course   |
|--------|--|---|
| Course | Code: GLMC3AL  | Course Title: PROGRAMMING IN C LAB  |
| On suc | cessful completion of the course, the lea  | rners should be able to   |
| CO1:   | choose conditional control making sta  | tements 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  |   |
|        | list the formulae to calculate H.C.F at  | nd L.C.M of Numbers, square roots and cube  |
|        | Code: GLMC3N   | Course Title: NUMERICAL APTITUDE I  |
| CO1:   | cessful completion of the course, the lea<br>list the formulae to calculate H.C.F at   |   |
|        | roots,<br>average, ages percentage ,profit and l<br>distance   | oss, and ratio.proportion time and work ,time and   |
| CO2:   | build the problem solving skills on qu   | antitative 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:   |  | M of Numbers, square roots and cube roots,<br>oss, and ratio.proportion time and work ,time and |
| CO5:   | develop skills to attend the competitiv  | e exams confidently.  |
|        |  |   |

|  | Core Course   |  |  |
|--|---|--|--|
| Course Code: GLMC41 Course Title: GRAPH THEORY                         |   | 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 typ<br>trees and planar graphs.             | pes of graphs like Eulerian, Hamiltonian, bipartite, |  |
| CO3:   | apply logical argument / algorithm f<br>on<br>various concepts of graph theory. | or proving characterization, equivalence criterions  |  |
| CO4:   | identify the properties of vertex colo  | ouring and edge colouring in graphs                  |  |
| CO5:   | analyze the behavior of various kinds   | s of graphs.   |  |

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

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

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|  | Allied Course                          |                       |  |
|--|--|-----------------------|--|
| Course Code: GLMC4AL Course Title: PROGRAMMING IN C++<br>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 progr | rams.                 |  |
| CO5:   | improve programming skills.            |                       |  |

|   | Elective Course                            |   |  |
|---|--|---|--|
| Course Code: GLMC4N Course Title: NUMERICAL APTITUDE II |  |   |  |
| On succ   | cessful completion of the course, the lear | mers should be able to                  |  |
| CO1:  | recall the basic formulae in mathemati     | cs.                                     |  |
| CO2:  | develop problem solving skill in nume      | rical aptitude.                         |  |
| CO3:  | analyze and solve analytical problems      |   |  |
| CO4:  | evaluate problems on arithmetic.           |   |  |
| CO5:  | improve problem solving skills and at      | tend the competitive exams confidently. |  |

# **DISCIPLINE SPECIFIC COURSE**

## **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 me   | tric space. |
| CO5:   | analyze the characteristics and equivalence criterions of various concepts of real line.  |             |

|          | Core Course  |  |  |
|----------|--|--|--|
| Course ( | Course Code: GLMC52 Course Title: LINEAR ALGEBRA                       |  |  |
| On succ  | On successful completion of the course, the learners should be able to |  |  |
| CO1:     | define vector spaces, product spaces a                                 | nd theory of matrices.                             |  |
| CO2:     | solve system of simultaneous linear ec                                 | uations and computing eigen values ,eigen vectors. |  |
| CO3:     | develop knowledge on vector spaces a                                   | nd inner product spaces and matrices               |  |
| CO4:     | apply the concepts of basis, dimen matrices to Solve problems.         | sion of vector spaces, inner product spaces and    |  |
| CO5:     | analyze the characteristics of vector sp                               | paces, inner product spaces and matrices.          |  |

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|         | Elective Course   |         |  |
|---------|---|---------|--|
| Course  | Course Code: GLMC5E1     Course Title: LINEAR PROGRAMMING   |         |  |
| On succ | 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 T   | P / AP. |  |

| ~                      | Electi  | ive Course   |
|------------------------|---|--|
| Course                 | e Code: GLMC5E1   | Course Title: LINEAR PROGRAMMING                                     |
| On suc                 | ccessful completion of the course, the lea  | arners should be able to   |
| CO1:                   | explain LPP, canonical & standard fo<br>LPP.  | orm, primal-dual form and sub / special classes of                   |
| CO2:                   | express real life problem into mathem   | natical form.  |
| CO3:                   | apply efficient computational techniq<br>optimization problems, sub / special   | ues and algorithms that are needed to solve classes of LPP.          |
| CO4:                   | determine basic, feasible, infeasible, solutions to a LPP, TP and AP.   | IBFS, unbounded, degenerate/non degenerate                           |
| CO5:                   | examine the balanced / unbalanced T   | P / AP.  |
| Course                 | Electi<br>2 Code: GLMC5E2   | ive Course<br>Course Title: FOURIER ANALYSIS                         |
| Course                 |   |  |
|                        |   | Course Title: FOURIER ANALYSIS                                       |
|                        | e Code: GLMC5E2   | Course Title: FOURIER ANALYSIS<br>arners should be able to           |
| On suc                 | <b>Code: GLMC5E2</b><br>ccessful completion of the course, the lea  | Course Title: FOURIER ANALYSIS<br>arners should be able to<br>tions. |
| On suc<br>CO1:         | Code: GLMC5E2   | Course Title: FOURIER ANALYSIS<br>arners should be able to<br>tions. |
| On suc<br>CO1:<br>CO2: | ccessful completion of the course, the lea<br>define the expansion of periodic func<br>construct Fourier series for any funct | Course Title: FOURIER ANALYSIS<br>arners should be able to<br>tions. |

|  | 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 Gram  | mars and generate them for Languages. |  |

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| 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 succ  | 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<br>numbers.                 |  |  |

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|  | Core Course  |  |  |
|--|--|--|--|
| 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.  |  |  |

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| Elective Course |   |  |  |
|-----------------|---|--|--|
| Course          | Course Code: GLMC6E1 Course Title: OPERATIONS RESEARCH  |  |  |
| On succ         | 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<br>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 succ   | 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.   |  |  |

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| Elective Course  |  |  |  |
|--|--|--|--|
| Course Code: GLMC6E3 Course Title: AUTOMATA AND FORMAL LANGUAGES |  | Course Title: AUTOMATA AND FORMAL<br>LANGUAGES |  |
| On succ  | 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 com                                  | puter science.                                 |  |
| CO3:   | construct derivation trees.  |  |  |
| CO4:   | explain regular languages.   |  |  |
| CO5:   | build content free grammars language                                   | 28.  |  |

|         | Cor  | e Course                  |
|---------|--|---------------------------|
|         |  |                           |
| Course  | Code: GLMC6P                               | Course Title: Project     |
| On succ | essful completion of the course, the learn | ers should be able to     |
| CO1:    | relate computational skills to mathemat    | ical concept.             |
| CO2:    | apply programming skills to solve real     | life problems.            |
| CO3:    | analyze the strength and weakness of te    | am work.                  |
| CO4:    | explain the concept in the area of specia  | alization.                |
| CO5:    | improve various skills for further devel-  | opment in higher studies. |

|         | Cor  | e Course               |
|---------|--|------------------------|
| Course  | Code: GLMC6L                               | Course Title: MATLAB   |
| On succ | essful completion of the course, the learn | ners should be able to |
| CO1:    | explain the codings in MATLAB.             |                        |
| CO2:    | apply MATLAB for solving Mathemat          | tical problems.        |
| CO3:    | analyze the roots of the equation and the  | race the curve.        |
| CO4:    | evaluate optimal solution of LPP by us     | ing MATLAB.            |
| CO5:    | compile and discuss regression lines.      |                        |

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

|  | JOB ORIE  | ENTED COURSE  |
|--|---|---|
| Course                                 | Code: GLJO70  | Course Title: MATHEMATICAL STATISTICS               |
| On suc                                 | cessful completion of the course, the lea   | arners should be able to                            |
| CO1:                                   | recall the basic concepts of statistics.  |   |
| CO2:                                   | explain correlation coefficient and for   | rm regression lines for any bivariate data.         |
| CO3:                                   | apply statistical techniques to solve re  | eal life problems.                                  |
| CO4:                                   | analyze various statistical parameters.   |   |
| CO5:                                   | estimate a line of best fit.  |   |
| 0                                      |   | NTED COURSE Course Title: - MATHEMATICAL STATISTICS |
| Course                                 | JOB ORIE  |   |
|  | Code: GLJO70L   | Course Title: - MATHEMATICAL STATISTICS<br>LAB      |
|  |   | Course Title: - MATHEMATICAL STATISTICS<br>LAB      |
| On suc                                 | <b>Code: GLJO70L</b><br>cessful completion of the course, the lea   | Course Title: - MATHEMATICAL STATISTICS<br>LAB      |
| On suc<br>CO1:                         | Code: GLJO70L<br>cessful completion of the course, the lea<br>recall the fundamentals of SPSS pack  | Course Title: - MATHEMATICAL STATISTICS<br>LAB      |
| On suc<br>CO1:<br>CO2:                 | Code: GLJO70L<br>cessful completion of the course, the lea<br>recall the fundamentals of SPSS pack<br>apply SPSS packages to find solution<br>analyze the bivariate data and form re  | Course Title: - MATHEMATICAL STATISTICS<br>LAB      |
| On suc<br>CO1:<br>CO2:<br>CO3:         | Code: GLJO70L<br>cessful completion of the course, the lea<br>recall the fundamentals of SPSS pack<br>apply SPSS packages to find solution  | Course Title: - MATHEMATICAL STATISTICS<br>LAB      |
| On suc<br>CO1:<br>CO2:<br>CO3:<br>CO4: | Code: GLJO70L         cessful completion of the course, the lea         recall the fundamentals of SPSS pack         apply SPSS packages to find solution         analyze the bivariate data and form re         compare various types of charts. | Course Title: - MATHEMATICAL STATISTICS<br>LAB      |