GEMS ARTS AND SCIENCE COLLEGE, RAMAPURAM

DEPARTMENT OF MATHEMATICS

PROGRAMME OUTCOMES (POs), PROGRAMME SPECIFIC OUTCOMES (PSOs), and COURSE OUTCOMES (COs)

PROGRAMME: BSc. MATHEMATICS

PROGRAMME OUTCOMES (POS)

The programme outcome of the B.Sc Mathematics undergraduate course are the summation of the expected course learning outcomes given below.

PO1 Disciplinary knowledge:

Capability of demonstrating comprehensive knowledge of mathematics and understanding of one or more disciplines which form a part of an undergraduate programme of study.

PO2 Communications skills :

(i) Ability to communicate various concepts of mathematics effectively using examples and their geometrical visualizations

(ii) Ability to use mathematics as a precise language of communication in other branches of human knowledge...

(iii) Ability to show the importance of mathematics as precursor to various scientific developments since the beginning of the civilization.

PO3 Critical thinking:

Ability to employ critical thinking in understanding the concepts in every area of math-

ematics.

PO4 Analytical reasoning:

Ability to analyze the results and apply them in various problems appearing in different branches of mathematics.

PO5 Problem solving:

(i) Capability to solve problems using concepts of linear algebra.

(ii) Capability to solve various models such as growth and decay models, radioactive decay model. LCR circuits and population models using techniques of differential equations.

(iii) Ability to solve linear system of equations, linear programming problems and net- work flow problems

(iv) Ability to provide new solutions using the domain knowledge of mathematics ac- quired during this programme.

PO6 Research-related skills :

(1) Capability for inquiring about appropriate questions relating to the concepts in various fields of mathematics,

(ii) To know about the advances in various branches of mathematics:

PO7 Information/digital literacy: Capability to use appropriate software to solve system of equations and differential equations.

PO8 Self-directed learning:

Ability to work independently and do in-depth study of various notions of mathematics.

PO9 Lifelong Learning

Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.

PO10 Application Skills

Ability to apply the acquired knowledge in all aspects.

PO11 Experimental skills :

PO12 Moral and ethical awareness/reasoning:

Ability to identify unethical behaviour such as fabrication, falsification ormisrepresenta- tion of data and adopting objective, unbiased and truthful actions in all aspects

PROGRAMME SPECIFIC OUTCOMES (PSOS)

COURSE OUTCOMES (COs)

SEMESTER I

COURSE CODE	PAPER NAME	CREDITS	COURSE OUTCOME
MTS1B01	BASIC LOGIC AND NUMBER THEORY	4	**CO1**-Discusses the fundamentals of logic, its symbols and rules. This enables one to think systematically, to express ideas in precise and concise mathematical terms and also to make valid arguments. How to use logic to arrive at the correct conclusion in the midst of confusing and contradictory statements is also illustrated.
			CO2- Introduced the classical number theoryand some of the very fundamental results. It is hoped that the method of writing a formal proofusing proof

			methods
			CO3-Prove results involving divisibility, greatest common divisor, least common multiple and a few applications.Understand the theory and method of solutions of LDE.
			CO4-Solve linear congruent equations. Learn three classical theorems viz. Wilson's theorem, Fermat's little theorem and Euler's theorem and a few important consequences.

SEMESTER II

COURSE CODE	PAPER NAME	CREDITS	COURSE OUTCOME
MTS2B02	CALCULUS OF SINGLE VARIABLE 1	4	**CO1**-Introducethe fundamental ideas of limit, continuity and differentiability and also to some basic theorems of differential calculus.
			CO2-Explain the application of the ideas in the problem of sketching of curves and in the solution of some optimization problems of interest in real life.
			CO3-Deals with the branch of calculus viz. integral calculus and the geometric problem of finding out the area of a planar region.
			CO4-Illustrate the Fundamental Theorem of Calculus, which not only gives a practical way of evaluating the definite integral but establishes the close connection between the two branches of Calculus. Application of the solution of the area problem, arc length of a plane curve, volume and surface areas of solids

SEMESTER III

COURSE CODE	PAPER NAME	CREDITS	COURSE OUTCOME
MTS3B03	CALCULUS OF SINGLE VARIABLE 2	4	**CO1**-Introduce natural logarithm, logarithmic exponential function, hyperbolic functions and its applications
			CO2-Introduced to the idea of improper integrals, their convergence and evaluation. This enables to study a related notion of convergence of a series, which is practically done by applying several different

			tests such as integral test, comparison test and so on
			CO3-Study on power series their region of convergence, differentiation and integration
			CO4-Introduce the dea of parametrization of curves, they learn how to calculate the arc length, curvature etc. using parametrization and also the area of surface of revolution of a parametrized plane curve. Introduceother coordinate systems which often simplify the equation of curves and surfaces and the relationship between various coordinate systems.

SEMESTER IV

COURSE CODE	PAPER NAME	CREDITS	COURSE OUTCOME
MTS4B04	LINEAR ALGEBRA	4	**CO1**-Introduce the fundamentals of linear algebra and system of linear equations. Discuss a number of methods for solving a system of linear equations.
			CO2-Introduce the idea of vector space, subspace, spanning vectors, basis and dimension and discuss fundamental results in these areas.
			CO3-Distinquish the solutions of a given system of linear equations and some important subspaces associated with the coefficient matrix of the system.
			CO4-Discuss practical method of finding out the eigenvalues from the characteristic equation and the corresponding eigenvectors

SEMESTER V

COURSE CODE	PAPER NAME	CREDITS	COURSE OUTCOME
MTS5B05	ABSTRACT ALGEBRA	4	**CO1**-Discuss the abstract notion of a group
			CO2-Discuus how to check whether an algebraic system forms a group or not
			CO3-Explain idea of structural similarity, the notion of cyclic group, permutation group, various examples
			CO4-
			CO5-
			CO6-
MTS5B06	BASIC ANALYSIS	4	**CO1**-Discuss many properties of real number system by assuming a few fundamental facts about it as axioms
			CO2-Explain sequences, their limits, several basic and important theorems involving sequences and their applications
			CO3-Explain some basic topological properties of real number system such as the concept of open and closed sets, their properties, their characterization and so on
			CO4- Introduction to algebraic, geometric and topological structures of complex number system, functions of complex variable, their limit and continuity and so on
MTS5B07	NUMERICAL ANALYSIS	3	**CO1**-Explain several methods such as bisection method, fixed point iteration method, regula falsi method etc. to find out the approximate numerical solutions of algebraic and transcendental equations with desired accuracy
			CO2-Discuss concept of interpolation and also some well known interpolation techniques.
			CO3-Illustrate techniques for numerical differentiation and integration and also realize their Merits and demerits.
			CO4-Explain how to find numerical approximations to solutions of initial value problems

MTS5B08	LINEAR PROGRAMMING	3	**CO1**-Explain how to solve linear programming problems geometrically
			CO2-Discuss solve LP problems more effectively using Simplex algorithm
			CO3-Explain duality theory, a theory that establishes relationships between linear programming problems of maximization and minimization
			CO4 Explain how to solve transportation and assignment problems
MTS5B09	INTRODUCTION TO GEOMETRY AND THEORY OF EQUATIONS	3	**C01** Explain several basic facts about parabola, hyperbola and ellipse (conics) such as their equation in standard form, focal length properties, and reflection properties, their tangents and normal.
			C02 Explain Kleinian view of Euclidean geometry
			C03 Explain affine transformations, the inherent group structure, the idea of parallel projections and the basic properties of parallel projections
			C04 Explain how to Learn to solve polynomial equations upto degree four.
MTS5 D04	MATHEMATICS FOR DECISION MAKING	3	**C01** Explain the classifications of data and introduce to various data collection
			C02 Explain concepts like measures of central tendency, measures of variation and measures of position
			C03 Discuss various probability distributions of discrete and continuous variables.
			C04 Discuss standard normal distribution and learns the conversion of normal variable to standard normal variable

SEMESTER VI

COURSE CODE	PAPER NAME	CREDITS	COURSE OUTCOME
MTS6B10	REAL ANALYSIS	5	**CO1**- Understand several deep and fundamental results of continuous functions on intervals such as boundedness theorem, maximum-minimum theorem, intermediate value theorem, preservation of interval theorem and so on.
			CO2- Realise the difference between continuity and uniform continuity and equivalence of these ideas for functions on closed and bounded interval.
			CO3- Understand a few basic and fundamental results

			of integration theory.
			CO4- Understand two forms of fundamental theorem of calculus and their significance in the practical problem of evaluation of an integral.
			CO5- Learn and fnd out examples/counter examples to prove or disprove the validity of several mathematical statements that arise naturally in the process/context of learning.
			CO6- Learn the properties of and relationship among two important improper integrals namely beta and gamma functions that frequently appear in mathematics, statistics, science and engineering.
MTS6B11	COMPLEX ANALYSIS	5	**CO1**- To understand the difference between differentiability and analyticity of a complex function and construct examples.
			CO2-To know of harmonic functions and their connection with analytic functions
			CO3- To know a few elementary analytic functions of complex analysis and their properties.
			CO4- To know a few fundamental results on contour integration theory such as Cauchy's theorem, Cauchy-Goursat theorem and their applications.
			CO5- To see another application of residue theory in locating the region of zeros of an analytic function.
MTS6B12	CALCULUS OF MULTI VARIABLE	4	**CO1**- Understand several contexts of appearance of multivariable functions and their representation using graph and contour diagrams. _
			CO2- Get the idea of directional derivative, its evaluation, interpretation, and relationship with partial derivatives.
			CO3- Understand the notion of a vector field, the idea of curl and divergence of a vector field, their evaluation and interpretation. _
MTS6B13	DIFFERENTIAL EQUATIONS	4	**CO1**- They will learn what an ODE is, what it means by its solution, how to classify DEs, what it means by an IVP and so on. _
			CO2- They will realise the basic differences between linear and non linear DEs and also basic results that guarantees a solution in each case. _
			CO3- They will learn to find out a series solution for homogeneous equations with variable coefficients near ordinary points.
			CO4- Students acquire the knowledge of solving a

			differential equation using Laplace method which is especially suitable to deal with problems arising in engineering field.
			CO5- Students learn the technique of solving partial differential equations using the method of separation of variables
MTS6B14 (E01)	GRAPH THEORY	2	**CO1**- Understand and apply the fundamental concepts in graph theory and apply graph theory based tools in solving practical problems
			CO2- Analyze properties of graphs and understand trees and their properties
			CO3- Distinguish between Eulerian and Hamiltonian graphs and analyze planar graphs
MTS6B14 (E02)	TOPOLOGY OF METRIC SPACES	2	**CO1**- Student will be able to perform simple theoretical analysis involving sets in metric and topological spaces and maps between these spaces.
			CO2- Be able to apply these concepts to other areas of mathematics.
MTS6B14 (E03)	MATHEMATICAL PROGRAMMING WITH PYTHON AND LATEX	2	**CO1**- To understand basis of Python programming, and apply Python programming in plotting mathematical functions
			CO2- Apply Python programming in numerical analysis
			CO3- Understands typesetting using Latex and apply Latex in writing equations