Teaching Plan for B. Sc Mathematics

Academic Year 2019-2020

Programme Outcomes (PO)

PO	Upon completion of the B.Sc. Degree Programme, the graduates will be able to
PO - 1	apply the acquired scientific knowledge to face day to day needs.
PO - 2	create innovative ideas through laboratory experiments.
PO - 3	carry out field works and projects independently and in collaboration with other institutions and industries.
PO - 4	reflect upon green initiatives and take responsible steps to build a sustainable environment.
PO - 5	face challenging competitive examinations that offer rewarding careers in science and education.
PO - 6	impart communicative skills and ethical values.
PO - 7	equip students with hands on training through various courses to enhance entrepreneurship skills.

Programme Specific Outcomes (PSO)

PSO	Upon completion of B.Sc. Mathematics, the graduates will be able to	PO Addressed
PSO - 1	acquire a strong foundation in various branches of mathematics to formulate real life problems into mathematical models.	PO - 1
PSO - 2	develop problem solving skills, cultivating logical thinking, and face competitive examinations with confidence	PO - 5
PSO - 3	enhance numerical ability and address problems in interdisciplinary areas which would help in project and field works.	PO - 3
PSO - 4	apply the mathematical knowledge and skills to face competitive examination with confidence.	PO - 5
PSO - 5	pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc.	PO - 5
PSO - 6	develop entrepreneurial skills, become empowered and self-dependent in society.	PO - 7
PSO - 7	understand the professional, ethical, legal, security, social issues and responsibilities.	PO - 4
PSO - 8	apply knowledge of principles, concepts and results in specific subject area to analyse their local and global impact.	PO - 3
PSO - 9	communicate appropriately and effectively, in a scientific context using present technology and new findings.	PO - 6

Semester I : **I**

Name of the Course : **Differential Calculus and Trigonometry**

Course Code : **MC1711**

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

Objectives

1. To impart knowledge on applications of Differential Calculus and important concepts of Trigonometry
2. To enhance problem solving skills

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO – 1	recall the idea of derivative, rules of differentiation and understand the concept of p-r equation	PSO - 1	R
CO – 2	learn the concepts of curvature, circle of curvature, evolute and apply the concepts to solve problems.	PSO - 2	U, Ap
CO – 3	recognize the rules of identifying asymptotes and employ the same to different curves	PSO - 3	Ap, U
CO – 4	acquire the knowledge about hyperbolic functions and compare it with circular functions, trigonometric functions , inverse trigonometric functions and their properties.	PSO - 1	U, E
CO – 5	categorize the methods of finding the sum of trigonometric series	PSO - 8	An

Total contact hours: 90 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture Hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Curvature**					
	1	Introduction and definition of pedal equation	2	Recall the idea of derivative, rules of differentiation and understand the concept of p-r equation	Lecture	Test
	2	Problems related to p-r equations	6	Apply the concept of p-r equation in problems	Lecture with Illustration	Group Discussion
	3	Introduction, definition and theorems based on of curvature	3	To understand the definition of curvature and learn the theorems	Lecture	Test
	4	Radius of curvature in different forms	2	To understand the definitions of closed setsand limit points with examples and theorems	Lecture	Test
	5	Problems related to Radius of curvature	2	To understand the problems related to Radius of curvature	Lecture with Illustration	Group Discussion
II	**Centre of Curvature, Evolute**					
	1	Definition and problems based on centre of curvature of the curve	5	To understand the definition of centre of curvature of the curve	Lecture	Test
	2	Definition and problems related to evolute of the curve	5	To understand the definition of evolute of the curve and practice problems	Lecture	Q&A
	3	Definition and problems on circle of curvature	5	To practice various problems related to circle of curvature	Lecture	Formative Assessment Test
III	**Asymptotes**					
	1	Definition and methods of finding asymptotes for the curve $y=f(x)$ and $f(x,y)=0$	3	To understand the methods of finding asymptotes	Lecture	Quiz
	2	Working rule to find the inclined asymptotes	2	Recognize the rules of identifying asymptotes	Lecture with Illustration	Test

	3	Problems on linear asymptotes and intersection of curves	5	To apply the rules to different curves	Lecture with Group Discussion	Brain Storming
	4	Problems based on inclined asymptotes	5	To apply the rules to different curves	Lecture	Assignment
IV	**Hyperbolic Functions, Logarithm of Complex Numbers**					
	1	Introduction and definition of Hyperbolicfunctions	2	Acquire the knowledge about hyperbolic functions	Lecture with Illustration	Quiz
	2	Problems based on hyperbolic functions	4	To compare with circular functions	Lecture	Q&A
	3	Definitions and Problems based on inverse hyperbolic functions	4	Acquire the knowledge about inverse hyperbolic functions	Lecture	Slip Test
	4	Separate into real and imaginary partsof hyperbolic and inverse hyperbolic functions	5	To distinguish various hyperbolic functions, trigonometric functions, inverse trigonometricfunctions	Lecture	Formative Assessment Test
V	**Summation of Trigonometric Series**					
	1	Introduction and Illustrations basedon method of difference	4	To analyze the methodsof finding the sum of trigonometric series	Lecture with Illustration	Quiz
	2	Theorem and problems on sum of sines and cosines of n angles in A.P	7	To categorize problems on sum of sines and cosines of n angles in A.P	Lecture	Test
	3	Introduction of C+iS method	1	To know C+iS method	Lecture	Slip Test
	4	Problems related to C+iS method	3	To apply C+iS method to find the sum of trigonometric series	Lecture	Assignment

Course Instructor **Head of the Department**

Dr. K. Jeya Daisy **Dr. V. M. Arul Flower Mary**

Semester I : **I**

Name of the Course : **Algebra and Calculus (Allied for Physics & Chemistry)**

Course Code : **MA1711**

No. of hours per week	Credits	Total No. of hours	Marks
6	5	90	100

Objectives

1. To impart knowledge in concepts related to Algebra
2. To solve problems in Physical Science

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO – 1	recall the fundamentals of algebraic equations, matrices and rules of integration	PSO - 1	R
CO – 2	practice the formation of equations and compute symmetric functions of roots in terms of coefficients	PSO - 2	U, Ap
CO – 3	revise the properties of Eigen values of the matrices	PSO - 3	Ap, U
CO – 4	learn Beta, Gamma functions and evaluate integrals using them	PSO - 4	U, E
CO – 5	practice the expansion of Fourier series and utilize the same for higher studies	PSO - 5	An

Total contact hours: 90 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture Hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Theory of Equations**					
	1	Basic definition about Polynomial and its roots, Fundamental Theorem of Algebra and related theorems without proof	3	To recall the fundamentals of algebraic equations, matrices and rules of integration	Lecture	Short Test
	2	Formation of equations of lowest degree with rational coefficients and solving equations when one root and two roots given	3	Practice the formation of equations and to solve equations when one root and two roots given	Lecture and Group Discussion	Test
	3	Formation of equation of the lowest degree with rational coefficients whose rootsare given	3	Practice the formation of equations and compute symmetric functions of roots in terms of coefficients whose roots are given	Lecture	Test
	4	Proving that the given equation has no imaginary roots and Relation between rootsand coefficients	2	To Prove that the given equation has no imaginary roots and understand the relation between roots and coefficients	Lecture	Test
	5	Solving equations if their roots are in G.P,A.P	2	To Solve equations if their roots are in G.P, A.P.	Lecture	Test
	6	Solving equations and finding equal roots two pairs of equal roots, roots which are in some ratio	2	To Solve equations and finding equal roots, two pairs of equal roots, roots which are in some ratio	Lecture	Test
II	**Transformation of Equations**					
	1	Formation of equation whose roots are k times the roots of f(x) = 0	3	To understand the transformation of equations and	Lecture and discussion	Test

				formation of equation whose roots are k times the roots of f(x) = 0		
	2	Form the equation whose roots are negative of the roots ofthe given equation andwhose roots are diminished by *h*	3	To identify the equation whose roots are negative of the roots of the given equation and whose roots are diminished by *h*	Lecture	Formative Assessment
	3	Solve the equation whose roots are equal in magnitude but opposite in sign to the roots of f(x) =0 and to increase the roots of f(x) = 0 by h	3	To identify the equation whose roots are equal in magnitude but opposite in sign to the roots of f(x) =0 and to increase the roots of f(x) = 0 by h	Lecture	Test
	4	Solving the given equation and find the real root using Newton'smethod	3	To calculate the given equation and find the real root using Newton's method	Lecture	Test
	5	Finding positiveand negative roots of the equation using Newton's method	3	To identify positive and negative roots of the equation using Newton's method	Lecture and discussion	Test
III	**Matrices**					
	1	Basic concepts of matrix addition, matrix multiplication and rank of a matrix and definitions	3	To understand the basic concepts in matrices	Lecture	Test
	2	Test the consistency ofthe system of given homogenous equations and solving if it is consistent.	2	To solve homogenous equations if it is consistent	Lecture and discussion	Test
	3	Cayley Hamilton theorem and Solvingproblems based on Cayley Hamilton theorem	2	To understand Cayley Hamilton theorem solve problems based on it	Lecture	Test
	4	Defining matrix polynomial, Characteristic matrix, Characteristic	2	To identify Characteristic matrix, Characteristic	Lecture	Test

		polynomial and Characteristic equation		polynomial and Characteristic equation		
	5	Evaluating the sum and product of the Eigen values of the matrix without actually finding the Eigen values	2	To evaluate the sum and product of the Eigen values of the matrix without actually finding the Eigen values	Lecture	Test
	6	Evaluating Characteristic roots, Eigen values and Eigenvectors of the matrix	2	To evaluate Characteristic roots, Eigen values and Eigen vectors of the matrix	Lecture	Test
	7	Evaluating the sum and product of the Eigen values of the matrix without finding the roots of the characteristic equation	1	To evaluate Characteristic roots, Eigen values and Eigen vectors of the matrix	Lecture	Formative Assessment
	8	Evaluating the characteristic vectors corresponding to each characteristic root of the given matrix	1	To evaluate characteristic vectors corresponding to each characteristic root of the given matrix	Lecture	Test
IV	**Beta and Gamma Functions**					
	1	Introduction to Beta, Gamma functions, its properties	4	To learn Beta, Gamma functions and its properties	Lecture and discussion	Test
	2	Evaluation of integrals using Beta Functions	2	To evaluate integrals using Beta Functions	Lecture	Test
	3	Proving duplication formula	3	To prove duplication formula	Lecture	Test
	4	Problems based on Beta and Gamma functions	3	To solve problems based on Beta and Gamma functions	Lecture	Test
	5	Proving some results on Beta and Gamma functions	3	To prove some results on Beta and Gamma functions	Lecture	Test
V	**Fourier Series Expansion**					
	1	Fourier Series Expansion and Fourier coefficients	2	To understand Fourier Series Expansion and Fourier coefficients	Lecture	Test

	2	Explanation of Sine Series and Cosine Series and results based on them	2	To identify Sine Series and Cosine Series and results based on them	Lecture	Test
	3	Evaluate the Fourier Sine series and Fourier Cosine series for the given function	3	To evaluate the Fourier Sine series and Fourier Cosine series for the given function	Lecture	Test
	4	Evaluate the Half range Fourier Sine Series and Fourier Cosine Series for the given function	3	To evaluate the half range Fourier Sine Series and Fourier Cosine Series for the given function	Lecture	Test
	5	Evaluate the Fourier series for the given function and deduce certain results	3	To evaluate the Fourier series for the given function and deduce certain results	Lecture	Test
	6	Evaluate the Fourier series for the givenfunction in the intervals $(-\pi,\pi)$ and $(0,\pi)$	2	To evaluate the Fourier series for the given function in the intervals $(-\pi,\pi)$ and $(0,\pi)$	Lecture	Formative Assessment

Course Instructors

Dr. S. Sujitha

Ms. J. C. Mahizha

Head of the Department

Dr. V. M. Arul Flower Mary

Semester : **I**

Name of the Course : **Quantitative Aptitude – I(NME)**

Course code : **MNM171**

No. of hours per week	Credits	Total No. of hours	Marks
4	2	60	100

Objectives:

1. To develop the quantitative aptitude of the students
2. To solve problems required for various competitive examinations

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO - 1	recall the formation of number system	PSO – 1	R
CO - 2	review the rules of operations on numbers	PSO – 2	U
CO - 3	differentiate and compare different types of fractions	PSO – 3	An
CO - 4	apply BODMAS rule for simplification and determine missing numbers in a sequence	PSO – 5	Ap
CO - 5	construct the mathematical simple real life problems and develop solutions	PSO – 9	C

Total contact hours: 60 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture Hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Numbers**					
	1	Introduction of number system, face value of a digit in a number, Illustrations of a face value	3	To acquire a strong foundation in understanding the number system	Lecture with Illustration	Q & A
	2	Place value of a digit in a number, Examples of a place value	2	To differentiate between face value and place value of a number	Group Discussion	Brainstorming
	3	Test of divisibility, Examples based on test of divisibility, Applications of algebraic formulae, Results on some series	4	To learn short cut methods to solve problems on divisibility and series	Lecture with Illustration	Slip Test
II	**HCF and LCM**					
	1	HCF of numbers, LCM of numbers, Factorization method	3	To learn various rules of operations on numbers	Lecture with PPT	Jigsaw
	2	Common division method, Examples based on division methods, HCF and LCM of decimal fraction	3	To acquire detailed knowledge on HCF and LCM and its uses in solving problems	Lecture with Illustration	Assignment
	3	Examples based on HCF and LCM of decimal fraction, Comparison of fractions, Examples based on comparison of fractions	3	To identify the different methods to solve the given problem	Cooperative Learning	Formative Assessment Test
III	**Decimal Fraction**					
	1	Introduction of decimal fraction, Conversion of decimal into vulgar fraction, Examples related to conversion of decimal into vulgar fraction	4	To differentiate and compare different types of fractions	Lecture and small groups	Quiz
	2	Operations on decimal fractions	3	To develop problem solving skill cultivating logical thinking	Lab	Discussion

	3	Recurring decimal, Mixed recurring decimal	2	To learn techniques to solve problems involving fractions	Lecture and Discussion	Multiple choice questions
IV	**BODMAS Rule**					
	1	Simplification of numbers, BODMAS rule, Examples based on BODMAS rule	4	To apply BODMAS rule for simplification	Lecture and Group Discussion	Quiz
	2	Modulus of a real number, Examples related to Modulus of a real number	2	To learn to solve problems based on modulus of a real number	Lecture and Group Discussion	Brainstorming
	3	Virnaculam (Bar), Illustrations based on Virnaculam, Missing numbers in the given expression	2	To learn about Virnaculam and to determine missing numbers in a sequence	Lecture with Illustration	Test
V	**Square and Cube Test**					
	1	Introduction of square root and cube root, Finding square root by factorization method, Examples based on factorization method, Finding perfect square	4	To construct the mathematical simple real life problems and develop solutions	Lecture and Lab	Slip Test
	2	Finding perfect square, Examples related to perfect square	3	To acquire skills to solve problems involving perfect square	Lecture and small groups	Formative Assessment Test
	3	Finding perfect cube, Examples related to perfect square	2	To study about perfect cube and to solve problems related to perfect square	Lecture and Jigsaw	Assignment

Course Instructor
Ms. T. Sheeba Helen

Head of the Department
Dr. V. M. Arul Flower Mary

Semester : **III**

Name of the Course : **Differential Equations and Vector Calculus**

Course code : **MC1731**

No. of hours per week	Credits	Total No. of hours	Marks
6	4	90	100

Objectives:

1. To gain deeper knowledge in differential equations, differentiation and integration of vector functions
2. To apply the concepts in higher mathematics and physical sciences

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO -1	distinguish linear, nonlinear, ordinary and partial differential equations	PSO – 4	An
CO -2	solve linear differential equations with constant and variable coefficients	PSO – 8	U
CO -3	explain the basic properties of Laplace Transforms and Inverse Laplace Transforms.	PSO – 1	U
CO -4	use the Laplace transform to find the solution of linear differential equations	PSO – 2	Ap
CO -5	learn methods of forming and solving partial differential equations	PSO – 3	U
CO -6	learn differentiation and integration of vector valued functions	PSO – 4	U
CO -7	evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gauss divergence theorem	PSO – 8	Ap, E
CO -8	apply the concepts to solve problems in physical sciences and engineering	PSO – 3	Ap

Total contact hours: 90 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture Hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Linear Differential Equations**					
	1	Introduction of Linear Differential equations with constant coefficients, Formation of auxillary equation and finding the complementary function, Finding the particular integral for e^{ax}	5	Distinguish linear, nonlinear, ordinaryand partial differential equations, Solve linear differential equations with constant and variable coefficients	Lecture with Illustration	Evaluation through: Short test on finding the particular integral
	2	Finding the particular integral for cos ax, sin ax, Finding the particular integral for $e^{ax}f(x)$	3	Solve linear differential equations with constant and variable coefficients	Lecture with PPT Illustration	
	3	Finding the particular integral for $x^nf(x)$, Introduction of homogeneous linear equations, Conversion of homogeneous linear equations into linear differential equations with constant coefficients	3	Distinguish linear , nonlinear, ordinaryand partial differential equations, Solve linear differential equations with constant and variable coefficients	Lecture with Illustration	Short test on homogeneous linear equations Formative Assessment-I
	4	Solving homogeneous linear equations using the logarithmic substitution, Solving homogeneous linear equations using the new operator	3	Solve linear differential equations withconstant and variable coefficients	Lecture with Illustration	
II	**Laplace Transform**					
	1	Definition of Laplace Transform, Properties of Laplace Transform, Computation ofLaplace Transform of standard functions	3	Explain the basic properties of Laplace Transform and inverse LaplaceTransform	Lecture with PPT Illustration	Short test on Computation of Laplace Transform of standard functions

	2	Problems on Laplace Transform, Definition of Inverse Laplace Transform, Properties of Inverse Laplace Transform	5	Explain the basic properties of Laplace Transform and inverse Laplace Transform	Lecture with Illustration	Assignment on the related problem Formative Assessment –II
	3	Computation of Inverse Laplace Transform of specific functions, Problems on Inverse Laplace Transform	3	Explain the basic properties of Laplace Transform and inverse LaplaceTransform	Lecture with Illustration	
	4	Solving Linear Differential equations using Laplace Transform, Solving simultaneous equations using Laplace Transform	4	Use the Laplace transform in finding the solution of linear differential equations	Lecture with Illustration	
III	**Partial Differential Equations**					
	1	Introduction of Partial differential equations, Formation of Partial differential equations by eliminating theunknown constants, Formation of Partial differential equations by eliminating the arbitrary functions	4	Learn methods of forming and solving partial differential equations	Lecture with Illustration	Short test on formation of Partial differential equations by eliminating the unknown constants, and arbitrary function Quiz Formative Assessment-III
	2	Methods of solving Partialdifferential equations, Standard formof Lagrange's equation, General solution of Lagrange's equation	3	Learn methods of forming and solving partial differential equations	Lecture with PPT Illustration	
	3	Solving Lagrange's equation by method of grouping, Solving Lagrange's equation by method of multipliers	4	Learn methods of forming and solving partial differential equations	Lecture with Illustration	
	4	Solution of Lagrange's equation using grouping and suitable	4	Learn methods of forming and solving partial differential equations	Lecture Discussion	

		multipliers, Explanation of Charpit's method, Finding the solution of PDE using Charpit's method				
IV	**Vector Differentiation**					
	1	Revision of dot and cross product of vectors, Definition and theorems on differentiation of Vectors, Gradient of a scalar function and its properties	4	Learn differentiation and integration of vector valued functions	Lecture with PPT Illustration	Short test on gradient & differentiation of Vectors
	2	Problems based on Gradient, Equation of tangent plane and normal line for a single surface, Equation of tangent line and normal plane for the intersection of two surfaces	4	Learn differentiation and integration of vector valued functions	Lecture with Illustration	Formative Assessment-I
	3	Angle betweentwo surfaces, Divergence of vectors and its properties, Curl of vectors and its properties	3	Learn differentiation and integration of vector valued functions	Lecturewith Illustration	Short test on Divergence, Curl, Solenoidal and irrotational vectors,
	4	Solenoidal and irrotational vectors, Harmonic vectors and Laplace's equation, Problemsbased on divergence and curl	4	Learn differentiation and integration of vector valued functions	Lecture with Illustration	Formative Assessment-II
V	**Vector Integration**					
	1	Definition of line integrals and workdone by a force, Parametric equation of curves, Evaluation of line integrals over curves in a plane, Evaluation of line integrals over curves in a surface	4	Evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gauss divergence theorem	Lecture with Illustration	Short test on Evaluation of line integrals Formative Assessment-II

	2	Computation of work done by a force, Projection of a surface over aplane, Definition of surface integrals, Evaluation of surface integrals over a plane	4	Evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gaussdivergence theorem, Apply the concepts to solve problems in physical sciencesand engineering	Lecture with Discussion	Short test on Green's theorem & Stoke's theorem Short test on Gauss Divergence theorem Formative Assessment-III
	3	Evaluation of surface integralsover a cube and parrelopiped, Evaluation of surface integrals over a sphere, cylinder and cone, Statement and verification of Green's theorem	4	Evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gaussdivergence theorem, Apply the concepts to solve problems in physical sciences and engineering	Lecture with Illustration	
	4	Statement and verification of Stoke's theorem, Statement and verification of Gauss Divergence theorem	4	Evaluate line and surface integrals using Green's theorem, Stoke's theorem and Gauss divergence theorem, Apply the concepts to solve problems in physical sciences and engineering	Lecture with Illustration	

Course Instructor
Dr. V. Sujin Flower

Head of the Department
Dr. V. M. Arul Flower Mary

Semester : **III**

Name of the Course : **Sequence and Series**

Course code : **MC1732**

No. of hours per week	Credits	Total No. of hours	Marks
5	4	75	100

Objectives:

1. To introduce the primary concepts of sequences and series of real numbers
2. To develop problem solving skills

Course Outcomes

CO	Upon completion of this course the student will be able to	PSO Addressed	CL
CO-1	explain the primary concepts of sequences and series of real numbers	PSO – 1	U
CO-2	define convergence and divergence of sequences and series	PSO – 1	R
CO-3	distinguish between convergence and divergence of sequences and series	PSO – 2	U
CO-4	relate the behaviour of monotonic and geometric sequences and series	PSO – 8	Ap
CO-5	calculate the limit and peak point of sequences	PSO – 3	An
CO -6	analyze the importance of Cauchy's general principle of convergence of sequences and series	PSO – 7	An
CO – 7	evaluate the convergence of series using different types of tests.	PSO – 4	E
CO – 8	develop the skill of analyzing in sequence and series.	PSO – 4	An

Total contact hours: 75 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture Hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Preliminaries**					
	1	Preliminaries – Mathematical Induction	3	Explain the primary concepts of the Mathematical Induction	Lecture with Illustration	Evaluation through appreciative inquiry
	2	Finite and Infinite Sets	3	To distinguish between finite and infinite set	Lecture with PPT	Evaluation through quizzes and discussions
	3	Theorems based on the Real Numbers and the algebraic and order properties of R	3	To understand the theorems based on the Real Numbers and the algebraic and order properties of R	Lecture with Illustration	Slip Test
	4	Absolute value and the real line	3	To understand Absolute value and the real line	Discussion with Illustration	Quiz andTest
II	**The Real Numbers**					
	1	The Real Numbers-The completeness property of R.	3	To know about the completeness property of R	Lecture with PPT	Evaluation through discussions
	2	Applications of the supremum property	3	To know about Applications of the supremum property	Lecture	Evaluation through appreciative inquiry
	3	Intervals	3	To identify Intervals	Lecture	Formative Assessment Test
III	**Sequences**					
	1	Sequences- Definitions Range of Sequences, Limit of a Sequence, Bounded Sequence	3	Explain the primary concepts of sequences and series of real numbers	Lecture with Illustration	Evaluation through appreciative inquiry
	2	Theorems based on bounded Sequence, Problems based on bounded Sequence, Monotonic Sequence	3	To distinguish between bounded and monotonicsequences	Lecture with PPT	Evaluation through quizzes and discussions
	3	Theorems based on Monotonic Sequence	3	To understand the theorems based on	Lecture with Illustration	Slip Test

		Convergent Sequence Theorems based on Convergent Sequence		Convergent Sequence and Divergent Sequence		
	4	Behavior of monotonic sequence	3	To understand behavior of monotonic sequence	Discussion with Illustration	Quiz andTest
IV	**Subsequences**					
	1	Subsequences-Definition, Theorems based on Subsequences Subsequences-Examples	2	Explain the primary concepts of Subsequences	Lecture with PPT Illustration	Evaluation through discussions
	2	Peak points-Examples, Limit points-Examples	3	Calculate the limit and peak point of sequences	Lecture with Illustration	Evaluation through appreciative inquiry
	3	Cauchy sequences-Definition, examples	3	To apply the principles of Cauchy sequences	Lecture	Formative AssessmentTest
	4	Theorems based on the upper and lower limits of a sequence	3	To identify the upper and lower limits of a sequence	Group Discussion	Slip Test
V	**Series of Positive Terms**					
	1	Series-Definition& Examples Series, Infinite series-Examples	3	Explain the primary concepts of series of realnumbers	Lecture with PPT Illustration	Evaluation through discussions
	2	Theorems and problems based on comparison Test	3	To understand the theorems and problems based on Comparison Test	Lecture and Group Discussion	Evaluation through Assignment
	3	Problems based on Kummer's Test, D'Alembert's Ratio Test, De Morgan and Bertrand's Test and Gauss Test	3	To solve the problems based on Kummer's Test, D'Alembert's Ratio Test, De Morgan and Bertrand's Test andGauss Test	Lecture with Illustration	Formative Assessment Test
	4	Problems based on Root Test and Condensation Test	3	To solve the problems based on Root Test and Condensation Test	Lecture with Illustration	Slip Test
	5	Problems based on Integral Test	2	To solve the problems based on Integral Test	Lecturewith Illustration	Quiz and Test

Course Instructor **Head of the Department**

Dr. M. K. Angel Jebitha **Dr. V. M. Arul Flower Mary**

Semester : **III**

Name of the Course : **Probability Theory and Distributions (Allied)**

Course code : **MA1731**

No. of hours per week	Credits	Total No. of hours	Marks
5	5	75	100

Objectives:

1. To impart knowledge on the basic concepts of Probability theory and Probability distributions
2. To apply the theory in real life situations

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO - 1	recall the definition of probability and set functions	PSO – 1	R
CO - 2	differentiate between probability and conditional probability and compute according to the requirement	PSO – 4	An
CO - 3	understand the definition of random variables, their types and related concepts	PSO – 1	U
CO - 4	detect the different probability distributions which are widely used	PSO – 4	An
CO - 5	apply the techniques to prove the properties of probability and related distributions	PSO – 8	Ap
CO - 6	choose the suitable probability distribution corresponding to a given data	PSO – 5	E
CO - 7	test the validity of a given data	PSO - 9	E

Total contact hours: 75 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture hours	Learning Outcomes	Pedagogy	Assessment/ evaluation
I	**Probability**					
	1	Probability, Experiment, Sample space	2	To know about probability, experiment and sample space of an event	Lecture with Illustration	Short Test
	2	Example and Theorems based on Events, Problems based on events and sample space	3	To solve problems based on events	Lecture with Illustration	Test
	3	Conditional Probability, Problems based on Conditional probability	3	To understand the conditional probability and its uses	Lecture with PPT Illustration	Quiz and Test
	4	Properties – Independent events, Theorems based on Independent events, Problems based on Independent events	3	To know the properties of independent event	Lecture with Illustration	Formative Assessment Test
	5	Baye's theorem and Problems based on Baye's theorem	2	To understand Baye's theorem and solve problem related to it	Lecture with Illustration	Test
II	**Random Variables**					
	1	Random variables, Distribution function, Discrete, continuous- Random variable	3	To understand the concept of random variable and its types	Group Discussion	Quiz and Test
	2	Problems based on Discrete random variable	2	To solve based on discrete random variable	Lecture with Illustration	Test
	3	Problems based on continuous- random variable	2	To solve based on continuous random variable	Lecture with Illustration	Test
	4	Mathematical expectation	2	To understand the concept of mathematical expectation	Group Discussion	Quiz and Test
III	**Moment Generating Function**					

	1	Moment Generating Function, Related examples, Problems based on Moment Generating Function, Properties of Moment Generating Function	3	To find the moment generating function of a random variable and its properties	Lecture with PPT Illustration	Quiz and Test
	2	Cumulant generating function, properties and Problems based on Cumulant generating Function	3	To find the cumulant generating function of a random variable and its properties	Group Discussion	Short Test
	3	Characteristic function, properties, Problems based on Characteristic function and Poisson distribution	3	To understand the characteristic function and it properties and to know about the Poission distribution and its applications	Lecture with Illustration	Test
	4	Theorems based on Poisson distribution, Problems based on Poisson distribution, Mode, Moment Generating Function of Poisson distribution	3	To find the mean, median, mode and mgf of Poisson distribution	Group Discussion	Short Test
	5	Theorems based on Mode, Moment Generating Function of Poisson distribution, fitting of Poisson distribution and problems based on this	3	To fitting the Poisson distribution and problems based on it	Lecture with Illustration	Test
IV	**Binomial Distribution**					
	1	Introduction-Definition, Moments of Binomial Distribution	3	To understand binomial distribution and its applications	Group Discussion	Short Test
	2	Central moments, Theorems based on Central moments	3	To identify the moments and central moments of binomial distribution	Lecture with Illustration	Test
	3	Mode of binomial distribution, Problems based on Mode of binomial distribution	3	To find the mean, median and mode of binomial distribution and solve problems related to it	Group Discussion	Short Test

	4	Fitting of binomial distribution, examples, Problems based on fitting of binomial distribution	3	To understand the fitting of binomial distribution	Lecture with Illustration	Test
V	**Normal Distribution**					
	1	Definition, Moment Generating Function about origin of normal distribution, Mean and variance	3	To understand normal distribution and its applications and find the mean, median and mode of normal distribution	Lecture with Illustration	Test
	2	Standard normal variate, mode, Median, Moment Generating Function about mean of Normal distribution, Theorems based on mean of normal distribution	3	To understand standard normal distribution and its applications and find its moments	Lecture with Illustration	Quiz and Test
	3	Problems based on Mean of normal distribution, Area property of normal distribution, Problems based on area of normal distribution	3	To fit the population in standard normal distribution using area method	Lecture with Illustration	Formative Assessment Test
	4	Quartile deviation for the normal distribution, fitting of normal distribution, Problems based on Fitting of normal distribution	3	To find the various deviation of normal distribution and fitting of normal distribution	Lecture with Illustration	Test

Course Instructor **Head of the Department**

Dr. J. Befija Minnie **Dr. V. M. Arul Flower Mary**

Semester : V

Name of the Course : Linear Algebra

Course code : MC1751

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

Objectives:

1. To introduce the algebraic system of Vector Spaces, inner product spaces
2. To use the related study in various physical applications

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO - 1	recall and define Groups ,Fields and their properties	PSO - 1	R
CO - 2	cite examples of vector spaces ,subspaces and linear transformations	PSO - 1	U
CO - 3	determine the concepts of linear independence, linear dependence , basis and dimension of vector spaces	PSO - 1	U
CO - 4	correlate rank and nullity ,Linear transformation and matrix of a Linear transformation	PSO - 2	Ap
CO - 5	examine whether a given space is an inner product space and the orthonormality of sets	PSO - 3	Ap

Total contact hours: 90 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture Hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Vector Spaces**					
	1	Vector spaces - Definition and Examples	3	Understand the basic definitions and fundamental concepts of Vector spaces	Lecture with Ilustration	Slip Test
	2	Sub spaces	4	Identify the difference between Vector spaces and Subspaces	Lecture	Brain Storming
	3	Sub spaces – solved problems	4	Learn to solve the problems based on sub Spaces	Lecture with Group Discussion	Assignment
	4	Linear Transformation	4	Understand the concept of Linear Transformation	Lecture with PPT	Jigsaw
II	**The span of a Set**					
	1	Span of a Set	4	Understand the definitions and basic concepts of span of a set	Lecture	Slip Test
	2	Linear Independence	4	Identify the difference between Linear Independence and dependence	Lecture with illustration	Assignment
	3	Basis	3	Understand the concept of Basis	Lecture with PPT	Formative Exam
	4	Dimension	4	Solve the problems based on Basis and dimension	Lecture with video	Slip Test
III	**Rank and Nullity**					
	1	Rank and Nullity	3	Understand the concept of Rank and Nullity	Lecture	Quiz
	2	Matrix of a linear transformation	3	Determine the concepts of Matrix of a linear transformation	Lecture with Illustration	Test
	3	Characteristic Equation	3	Solve the problems based on Characteristic Equation	Lecture with PPT	Slip Test

	4	Cayley –Hamilton Theorem	3	Learn the theory of Cayley –Hamilton theorem	Blended Learning	Assignment
	5	Eigen Values and Eigen vectors	3	Solve the problems based on Eigen Values and Eigen vectors	Lecture	Formative Exam
IV	**Inner Product Spaces**					
	1	Inner Product Spaces-Definition and Examples	5	Understand the definition and examples of Inner Product Spaces	Lecture with Illustration	Quiz
	2	Orthogonality	5	To practice various problems on Orthogonality	Lecture, Blended Learning	Brain Storming
	3	Orthogonal Complement	5	Learn to find the Orthogonal Complement	Lecture	Assignment
V	**Bilinear Form**					
	1	Bilinear forms	5	Understand the definition of Bilinear form	Lecture with Illustration	Quiz
	2	Quadratic forms	3	Distinguish between bilinear form and quadratic form	Lecture	Assignment
	3	Reduction of a quadratic form to the diagonal form	3	To practice various problems based on Reduction of a quadratic form to the diagonal form	Lecture	Formative Exam

Course Instructor **Head of the Department**

Dr. L. Jesmalar **Dr. V. M. Arul Flower Mary**

Semester : V

Name of the Course : Real Analysis

Course code : MC2052

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

Objectives:

1. To introduce Metric Spaces and the concepts of completeness, continuity, connectedness and compactness
2. To use these concepts in higher studies

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO - 1	understand the concepts of completeness, continuity and discontinuity of metric spaces	PSO - 1	U
CO - 2	apply the metric space theorems to real life situations	PSO - 4	Ap
CO - 3	distinguish between continuous functions and uniform continuous functions	PSO - 9	An
CO - 4	use basic concepts in the development of real analysis results	PSO - 1	C
CO - 5	understand the concepts of countable sets, metric space, connectedness, compactness of metric spaces	PSO - 7	U
CO - 6	develop the ability to reflect on problems that are quite significant in the field of real analysis	PSO - 8	Ap

Total contact hours: 90 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture Hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Metric Space and Open Set**					
	1	Introduction to real analysis, Definitions, examples and theorems on Countable and Uncountable Sets	4	To determine countableand uncountable sets	Lecture with PPT	Quiz
	2	Metric spaces definitions, problems and theorems	5	To explain about metricspaces	Lecture, Group discussion	Test
	3	Bounded sets definitions andproblems	2	To find out a set is bounded or unbounded	Lecture	Quiz
	4	Open ball, open sets definitions, examples, problems and theorems	3	To solve problems on open sets	Lecture with PPT	Assignment
	5	Equivalent metrics, Subspace	3	To analyze about equivalent metrics	Lecture	Test
II	**Closed Set and Complete Metric Space**					
	1	Interior of a set definitions, examples, problems and theorems	3	To analyze about interior of a set	Lecture with Group Discussion	Assignment
	2	Closed sets, closure definitions, examples, problems and theorems	4	To determine the closed sets and closure of the subsets	Lecture	Formative Assessment
	3	Limit point definitions, examples, problems and theorems, Dense sets definitions, examples, and theorems	3	To find the limit point	Lecture	Assignment
	4	Complete metric space definitions, examples, problemsand theorems	5	To analyze about complete metric space	Lecture with Group Discussion	Test
	5	Cantor's intersection theorem, Baire's Category theorem	3	To explain the theorems	Lecture	Test
III	**Continuous and Discontinuous Functions**					
	1	Continuity of functions definitions, examples, problems and theorems	4	To determine the continuity of a function	Lecture	Assignment

	2	Composition of continuous functions problems	3	To analyze about composition of continuous functions problems	Lecture	Assignment
	3	Homeomorphism examples	3	To learn to prove homeomorphism	Lecture with Group Discussion	Test
	4	Uniform continuity definitions, examples, problems and theorems	2	To determine the uniformly continuous functions	Lecture	Assignment
	5	Discontinuous functions definitions, examples, problems and theorems	5	To test the discontinuity of a function	Lecture with PPT	Test
IV	**Connected Space**					
	1	Connectedness definitions, examples, problems and theorems	3	To learn to prove the connectedness of the subsets	Lecture with Group Discussion	Quiz
	2	Connected subsets of R problems and theorems	3	To determine the connected subsets	Lecture	Formative Assessment
	3	Connectedness and continuity problems and theorems	3	To compare connectedness and continuity	Lecture with Group Discussion	Assignment
	4	Intermediate value theorem	1	To learn Intermediate value theorem	Lecture	Test
V	**Compact Space**					
	1	Compactness definitions, examples, and theorems	3	To explain the concept compactness	Lecture	Test
	2	Compact subsets of R theorems	2	To learn to prove the theorems	Lecture	Test
	3	Equivalent characterisations for compactness problems and theorems	5	To learn to prove the theorems	Lecture	Formative Assessment
	4	Compactness and continuity	3	To compare compactness and continuity	Lecture	Test

Course Instructor **Head of the Department**

Dr. J. Befija Minnie **Dr. V. M. Arul Flower Mary**

Semester : V

Name of the Course : Graph Theory

Course code : MC1753

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

Objectives:

1. To introduce graphs, directed graphs and the concepts of connectedness and labelings
2. To apply these concepts in research

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO - 1	understand the basic definitions to write the proofs of simple theorems	PSO - 1	U
CO - 2	employ the definitions to write the proofs of simple theorems	PSO - 2	Ap
CO - 3	relate real life situations with mathematical graphs	PSO - 3	Ap
CO - 4	develop the ability to solve problems in graph theory	PSO - 4	An
CO - 5	analyze real life problems using graph theory both quantitatively and qualitatively	PSO - 4	An

Total contact hours: 90 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Graphs and Sub graphs**					
	1	Graphs and Sub graphs -Definition and Examples, Degrees, Sub graphs, Isomorphism	4	Understand the basic definitions and fundamental concepts of graph theory	Lecture with Illustration	Brainstorming
	2	Ramsey Numbers, Independent sets and coverings, Intersection graphs and line graphs	4	Identify the difference between Independent setsand coverings and understand the concept of Intersection graphs and line graphs	Lecture with PPT	Slip Test
	3	Matrices, Operations on graphs	4	Learn to form adjacency and incidence matrices of a graph and learn different types of operations on graphs	Lecture with Group Discussion	Assignment Method
	4	Degree Sequences, Graphic Sequences	5	Understand the concept of Degree Sequences and Graphic Sequences	Lecture with Video	Test
II	**Connectedness**					
	1	Connectedness - Walks, Trails and Paths	5	Understand the definitions and distinguish among walks, trails and paths	Blended Learning	Brainstorming
	2	Connectedness and Components	5	Understand the definitions of cut point and bridge of a graph and analyze the connectedness of a graph	Lecture with PPT	Jigsaw
	3	Blocks, Connectivity	5	Understand the conceptof blocks and learn to find the connectivity of different graphs	Lecture with PPT	Formative Exam
	4	Eulerian Graphs, Hamiltonian Graphs	5	Understand the conceptof Eulerian graphs and Hamiltonian graphs	Lecture with Illustration	Test
III	**Trees**					

	1	Trees, Characterisation of trees, Centre of a tree	5	Understand the concept of trees	Lecture with PPT	Quiz
	2	Matchings, Matchings in bipartite graphs	5	Understand the concept of Matchings and to practice various Theorems	Blended Learning	Test
IV	**Planarity**					
	1	Planarity - Definition and properties	5	Cite examples of planar and non-planar graphs	Lecturewith Illustration	Quiz
	2	Colourability, Chromatic number and chromatic index	5	Learn to find the chromatic number of different graphs	Blended Learning	Formative Exam
	3	The Five colour Theorem, Chromatic polynomials	5	To practice various Theorems and learn to write the chromatic polynomial of different graphs	Lecture	Presentations
V	**Directed Graphs**					
	1	Directed Graphs - Definition and Basic Properties	4	Understand the definition of digraphs	Lecture with Illustration	Quiz
	2	Paths and Connections - Eulerian Trail	4	Distinguish between strongly connected and weakly connected digraphs and understand the concept of Eulerian trails	Lecture with PPT	Test
	3	Digraphs and Matrices - Tournaments	5	To practice various Theorems and understand the concept of Tournaments	Lecture with Group Discussion	Formative Exam

Course Instructor **Head of the Department**

Sr. S. Antin Mary **Dr. V. M. Arul Flower Mary**

Semester : V

Name of the Course : Numerical Methods

Course code : MC1755

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	4	75	100

Objectives:

1. To study Numerical differentiation and Numerical integration using different formulae
2. To develop various methods for solving applied scientific problems

Course Outcomes

CO	Upon completion of this course the students will be able to	PSO Addressed	CL
CO - 1	understand the basic definitions and meaning of interpolation	PSO - 1	U
CO - 2	select appropriate numerical methods and apply the same to various types of problems	PSO - 1	U
CO - 3	apply numerical methods to obtain approximate solutions to mathematical problems	PSO - 3	Ap
CO - 4	employ different methods of constructing a polynomial using various methods	PSO - 2	A
CO - 5	compare the rate of convergence of different numerical formula	PSO - 4	An
CO - 6	distinguish the advantages and disadvantages of various numerical methods	PSO - 4	An

Total contact hours: 75 (Including lectures, assignments and tests)

Unit	Section	Topics	Lecture hours	Learning Outcomes	Pedagogy	Assessment/ Evaluation
I	**Solutions of Algebraic and Transcendental Equations**					
	1	Iteration method and problems	3	To understand the non-linear algebraic equations - Iteration method	Lecture with Illustration	Evaluation through test
	2	More problems on Iteration method	2	To understand solving techniques of Iteration method	Lecture with Illustration	Quiz andTest
	3	Newton Raphson method and problems	3	To understand the non-linear algebraic equations - Newton Raphson method	Lecture with Illustration	Quiz through Quizzes
	4	More problems on Newton Raphson method	2	To solve problems using Newton Raphson method	Lecture with Illustration	Test
	5	Finite difference	3	To understand Finite difference	Lecture with PPT Illustration	Quiz andTest
	6	Difference Operators	2	To understand Difference operators	Lecture with Illustration	Formative Assessment Test
II	**Interpolation**					
	1	Newton's Interpolation formulae	4	To understand Interpolation	Lecture with PPT Illustration	Test
	2	Lagrange's Interpolation formula	4	To understand Lagrange Interpolation	Lecture with Illustration	Quiz and Test
	3	Divided difference	3	To understand Divided difference	Lecture with Illustration	Evaluation through test
	4	Newton's divided difference formula	4	To solve the problems using Newton's divided difference formula	Lecture with PPT Illustration	Formative Assessment Test
III	**Numerical Differentiation**					
	1	Derivatives using Newton's forward difference formula	4	To recall the basic concepts of Numerical differentiation	Lecture with Illustration	Evaluation through test
	2	Numerical differentiation using interpolation formulae	3	To solve the problems using Newton's	Lecture with PPT Illustration	Quiz through Quizzes

		for equal interval and problems		forward difference formula		
	3	Derivatives using Newton's backward difference formula	4	To learn the derivation of Newton's backward difference formula	Lecture with Illustration	Quiz andTest
	4	More problemson Newton's Backward difference formula	4	To solve the problems using Newton's backward difference formula	Lecture with PPT Illustration	Formative Assessment Test
IV	**Numerical Integration**					
	1	Newton cote's - quadrature formula	4	To understand Newton cote's - quadrature formula	Lecture with Illustration	Test
	2	Numerical integration by Trapezoidal rule	3	To learn the derivation of Trapezoidal rule and to solve the problems using Trapezoidal rule	Lecture with PPT Illustration	Quiz through Quizzes
	3	Numerical integration by Simpson's $(1/3)^{rd}$ rule	2	To learn the derivation of Simpson's $(1/3)^{rd}$ rule and to solve the problems using Simpson's $(1/3)^{rd}$ rule	Lecture with Illustration	Formative Assessment Test
	4	Numerical integration by Simpson's $(3/8)^{th}$ rule	4	To learn the derivation of Simpson's $(3/8)^{th}$ rule and to solve the problems using Simpson's $(3/8)^{th}$ rule	Lecture with Illustration	Test
V	**Numerical Solution of Differential Equation**					
	1	Sole the differential equation usingTaylor's series method	4	To understand Taylor's series method	Lecture with Illustration	Test
	2	More problems on Taylor's series method	4	To solve the differential equation using Taylor's series method	Lecture with PPT Illustration	Quiz andTest
	3	Sole the differential equation using Picard's method	4	To understand Picard's method	Lecture with Illustration	Quiz through Quizzes
	4	More problems on Picard's method	3	To solve the differential equation using Picard'smethod	Lecture with Illustration	Test

Course Instructor **Head of the Department**

Ms. A. Jancy Vini **Dr. V. M. Arul Flower Mary**