GOVERNMENT ARTS COLLEGE (AUTONMOUS),

COIMBATORE-18.

DEPARTMENT OF MATHEMATICS
M.Sc. Degree Course

PG - SCHEME OF EXAMINATIONS: CBCS PATTERN
(For the students admitted during the academic year 2018-2019 and onwards)

Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext– Min.	Total Pass Mark	Credits
Semester – I								
18MMA11C	**Core - I :** Modern Algebra	6	25	75	100	38	50	5
18MMA12C	**Core - II:** Real Analysis	6	25	75	100	38	50	5
18MMA13C	**Core - III:** Complex Analysis	6	25	75	100	38	50	5
18MMA14C	**Core - IV:** Ordinary Differential Equations	6	25	75	100	38	50	4
18MMA15E	**ELECTIVE – I:** Advanced Numerical Analysis.	6	25	75	100	38	50	3
Semester – II								
18MMA21C	**Core - V:** Topology	6	25	75	100	38	50	5
18MMA22C	**Core - VI:** Measure and Integration	6	25	75	100	38	50	5
18MMA23C	**Core - VII:** Operations Research	6	25	75	100	38	50	5
18MMA24C	**Core - VIII:** Partial Differential Equations	6	25	75	100	38	50	4
18MMA25E	**ELECTIVE – II :** Number Theory	6	25	75	100	38	50	3

Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext– Min.	Total Pass Mark	Credits
Semester – III								
18MMA31C	**Core – IX :** Mechanics	6	25	75	100	38	50	5
18MMA32C	**Core - X:** Graph Theory	6	25	75	100	38	50	5
18MMA33C	**Core – XI :** Functional Analysis	6	25	75	100	38	50	5
18MMA34C	**Core – XII :**Mathematical Statistics	6	25	75	100	38	50	5
18MMA35E	**Elective – III :** Object Oriented Programming with C++	6	25	75	100	38	50	3
Semester – IV								
18MMA41C	**Core - XIII:** Operator Theory	6	25	75	100	38	50	5
18MMA42C	**Core - XIV:** Fluid Dynamics	6	25	75	100	38	50	5
18MMA43C	**Core - XV:** Fuzzy Logic And Fuzzy Sets	6	25	75	100	38	50	5
18MMA44C	**Core – XVI :** Calculus Of Variations and Integral Equations	6	25	75	100	38	50	5
18MMA45E	**Elective – IV :** Matlab	6	25	75	100	38	50	3
	Total Credits				**2000**			**90**

MCA Degree Course

PG - SCHEME OF EXAMINATIONS: CBCS PATTERN

(For the students admitted during the academic year 2018-2019 and onwards)

Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext– Min.	Total Pass Mark	Credits
18BCA15C	Mathematical Foundations for Computer Applications (For MCA)	4	25	75	100	38	50	
18MCA25C	Operations Research (For MCA)	4	25	75	100	38	50	

Core - Includes core theory, practical and electives

Includes 25/40 continuous Internal Assessment Marks for Theory and Practical papers respectively

Project evaluation done by both Internal and External examiner for 80 Marks

CONTENTS

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	MODERN ALGEBRA	I	18MMA11C

OBJECTIVES:

To introduce the advanced concepts in group theory, Algebraic structure & Polynomial rings, Fields and Finite Fields.

UNIT: I

GROUP THEORY: Automorphisms - Cayley's theorem – Permutation Groups.
(Chapter 2 – Sections: 2.8 to 2.10)

UNIT: II

GROUP THEORY: Another counting principle – Sylow's theorems – Direct products.
(Chapter 2 – Sections: 2.11 to 2.13)

UNIT: III

RING THEORY: Polynomial rings – Polynomial rings over the rational field – Polynomial rings over commutative rings.
(Chapter 3 – Sections: 3.9 to 3.11)

UNIT: IV

FIELDS: Extension fields – Roots of polynomials – More about roots.
(Chapter 5 – Sections: 5.1, 5.3 and 5.5)

UNIT: V

FIELDS, FINITE FIELDS: The Elements of Galois Theory – Finite fields.
(Chapter 5 – Section: 5.6; Chapter 7 – Section: 7.1)

TEXT BOOKS:

1. **TOPICS IN ALGEBRA** – I.N. HERSTEIN, Second Edition, Vikas Publishing Company, New Delhi, Second Reprint, 2006.

REFERENCE BOOKS:

1. **A FIRST COURSE IN ABSTRACT ALGEBRA** – JOHN B.FRALEIGH, Narosa Publishing House, New Delhi.
2. **MODERN ALGEBRA** – SURJEET SINGH and QAZI ZAMEERUDDIN, Vikas Publishing Company, New Delhi.
3. **BASIC ABSTRACT ALGEBRA** – P.B.BHATTACHARYA, S.K.JAIN and S.R.NAIPAUL, Cambridge University Press, New York.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	REAL ANALYSIS	I	18MMA12C

OBJECTIVES:

To provide a development of the subject which is dynamic, up to date and at the same time not too pedantic. It provides a transition from elementary calculus to advanced courses in real function theory and it introduces the reader to some of the abstract thinking that pervades modern analysis.

UNIT: I

THE RIEMANN-STIELTJES INTEGRAL: The definition of The Riemann-Stieltjes integral – Step functions as integrators – Reduction of a Riemann-Stieltjes integral to a finite sum – Euler's summation formula – Monotonically increasing integrators. Upper and lower integrals – Additive and linearity properties of upper and lower integrals – Riemann's condition – Comparison theorems – Integrators of bounded variation – Sufficient conditions for existence of Riemann-Stieltjes integrals – Necessary conditions for existence of Riemann-Stieltjes integrals – Mean-value theorems for Riemann-Stieltjes integrals.

(Chapter 7 – Sections: 7.3, 7.8 to 7.18)

UNIT: II

INFINITE SERIES AND INFINITE PRODUCTS: Convergent and divergent sequences of complex numbers – Limit superior and limit inferior of real-valued sequence – Monotonic sequences of real numbers – Infinite series – Inserting and removing parenthesis – Alternating series – Absolute and conditional convergence – Tests for convergence of series with positive terms – The geometric series – The integral test – The big oh and little oh notation – The ratio test and root test – Dirichlet's test and Abel's test – Rearrangement of series – Riemann's theorem on conditionally convergent series.

(Chapter 8 – Sections: 8.2 to 8.8, 8.10 to 8.15, 8.17 to 8.18)

UNIT: III

INFINITE SERIES AND INFINITE PRODUCTS (CONTINUED): Subseries – Double sequences- Double series – Rearrangement theorem for double series – A sufficient condition for equality of iterated series – Infinite products.

SEQUENCES OF FUNCTIONS: Pointwise convergence of sequences of functions - Examples of sequences of real-valued functions – Definition of uniform convergence, Uniform convergence and continuity – The Cauchy's condition for uniform convergence – Uniform convergence of infinite series of functions.

(Chapter 8 – Sections: 8.19 to 8.23, 8.26; Chapter 9 – Sections: 9.1 to 9.6)

UNIT: IV

SEQUENCES OF FUNCTIONS (CONTINUED): Uniform convergence and Riemann-Stieltjes integration – Nonuniformly convergent sequences that can be integrated term by term – Uniform convergence and differentiation – Sufficient conditions for uniform convergence of a series.

MULTIVARIABLE DIFFERENTIAL CALCULUS: The directional derivative – Directional derivatives and continuity – The total derivative – The total derivative expressed in terms of partial derivatives – The matrix of a linear function – The Jacobian matrix – The chain rule.

(Chapter 9 – Sections: 9.8 to 9.11 and Chapter 12 - Sections: 12.2 to 12.5, 12.7 to 12.9)

UNIT: V

MULTIVARIABLE DIFFERENTIAL CALCULUS (CONTINUED): The Mean-Value Theorem for differentiable functions – A sufficient condition for differentiability – A sufficient condition for equality of mixed partial derivatives – Taylor's formula for functions from R^n to R^1

IMPLICIT FUNCTIONS AND EXTREMUM PROBLEMS: Functions with nonzero Jacobian determinant – The inverse function theorem – The implicit function theorem.

(Chapter 12 – Sections: 12.11 to 12.14 and Chapter 13 – Sections: 13.2 to 13.4)

TEXT BOOK:

MATHEMATICAL ANALYSIS – TOM M.APOSTOL, Second Edition, Narosa Publishing House, 2002.

REFERENCE BOOK:

REAL AND COMPLEX ANALYSIS – WALTER RUDIN, Tata McGraw Hill Publishing Company Limited.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	COMPLEX ANALYSIS	I	18MMA13C

OBJECTIVES:

On successful completion of the paper the students should have understood the concepts of Cauchy's theorem & periodic functions of complex numbers.

UNIT: I

THE GENERAL FORM OF CAUCHY'S THEOREM: Chains and cycles – Simple connectivity – Homology – The general statement of Cauchy's theorem – Proof of Cauchy's theorem

THE CALCULUS OF RESIDUES: The residue theorem – The argument principle – Evaluation of definite integrals.

(Chapter 4 – Sections: 4.1 to 4.5, 5.1 to 5.3)

UNIT: II

HARMONIC FUNCTIONS: Definition and basic properties – The mean value property – Poisson's formula

POWER SERIES EXPANSIONS: Weierstrass's theorem – The Taylor series – Laurent series.

(Chapter 4 – Sections: 6.1 to 6.3 and Chapter 5 – Sections: 1.1 to 1.3)

UNIT: III

PARTIAL FRACTIONS AND FACTORIZATION: Partial fractions – Infinite products – Canonical products – The Gamma function.

ENTIRE FUNCTIONS: Jensen's formula

(Chapter 5 – Sections: 2.1 to 2.4 and 3.1)

UNIT: IV

THE RIEMANN ZETA FUNCTION: The product development – Extension of $\xi(s)$ to the whole plane – The functional equation – The zeros of the zeta function.

NORMAL FAMILIES: Equicontinuity – Normality and compactness – Arzela's theorem

(Chapter 5 – Sections: 4.1 to 4.4, 5.1 to 5.3)

UNIT: V

SIMPLY PERIODIC FUNCTIONS: Representation by exponentials – The Fourier development – Functions of finite order.

DOUBLY PERIODIC FUNCTIONS: The periodic module – Unimodular transformations – The canonical basis – General properties of elliptic functions.

(Chapter 7 – Sections: 1.1 to 1.3, 2.1 to 2.4)

TEXT BOOK:

COMPLEX ANALYSIS – LARS.V.AHLFORS, Third Edition, McGraw Hill International Edition, Fifth Reprint, 1983.

REFERENCE BOOK:

THE ELEMENTS OF COMPLEX ANALYSIS – B.CHOUDHARY, Wiley Eastern Limited.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	ORDINARY DIFFERENTIAL EQUATIONS	I	18MMA14C

OBJECTIVES:

On successful completion of the paper the students should have understood the concepts of second order linear equations with variable coefficients and Existence and Uniqueness of solutions to first order equations

UNIT: I

LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS: Introduction – second order homogenous equation – Initial value problem – linear dependence and independence – A formula for the Wronskian.
(Chapter 2 - Sections: 1 to 5)

UNIT: II

LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS (CONTD): Non-homogeneous equation of order two – Homogeneous equations of order n – Initial value problems for n^{th} order equations – Equations with real constants-The non-homogeneous equation of order n-A special method for solving the non-homogenous equations.
(Chapter 2 - Sections: 6 to 11)

UNIT: III

LINEAR EQUATIONS WITH VARIABLE COEFFICIENTS: Introduction - Initial value problem for homogeneous equation – solution of the homogeneous equation – The Wronskian and linear independence – Reduction of the order of homogeneous equation.
(Chapter 3 - Sections: 1 to 5)

UNIT: IV

LINEAR EQUATIONS WITH REGULAR SINGULAR POINTS: The Legendre equations – Euler equation - second order equation with regular singular points an example and general case – solution and properties of Bessel's equation.
(Chapter 3 - Section: 8 and chapter 4 - Sections: 1 to 4 and 7 and 8)

UNIT: V

FIRST ORDER EQUATIONS – EXISTENCE AND UNIQUENESS: Existence and uniqueness of solution to first order equation – Equations with variable separated – Exact equation – Method of successive approximations – Lipschitz Condition – Convergence of the successive approximations.
(Chapter 5 - Sections: 1 to 6)

TEXT BOOK:

1. **AN INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS -** E.A.CONDDINGTON, Prentice Hall of India, New Delhi, 1994.

REFERENCE BOOKS:

1. **ESSENTIAL OF ORDINARY DIFFERENTIAL EQUATIONS –** R.P. AGARWAL and RAMESH C.GUPTA, McGraw Hill, New York, 1991.
2. **ORDINARY DIFFERENTIAL EQUATIONS -** D. SOMASUNDARAM, Narosa publishing House, Chennai, 2002.
3. **A COURSE IN ORDINARY DIFFERENTIAL EQUATIONS -** D. RAJ, D.P. CHOUDHURY and H.I.FREEDMAN, Narosa publishing House, Chennai, 2004.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	ADVANCED NUMERICAL ANALYSIS	I	18MMA15E

OBJECTIVES:

To introduce the concepts of solving polynomial equations, system of algebraic equations by using different Numerical Methods.

UNIT: I

SOLVING NONLINEAR EQUATIONS: Interval Halving (Bisection) – Linear Interpolation Methods – Newton's Methods – Muller's Method – Fixed-Point Iteration: x=g(x) Method – Multiple Roots – Nonlinear Systems.

(Chapter 1 – Sections: 1.1 to 1.7.)

UNIT: II

INTERPOLATION AND CURVE FITTING: Interpolating Polynomials – Divided Differences – Spline Curves – Bezier Curves and B-Splines Curves – Interpolating on a Surface – Least-Squares Approximations.

APPROXIMATION OF FUNCTIONS: Chebyshev Polynomials and Chebyshev Series- Rational Functions Approximations-Fourier Series.

(Chapter 3: Sections: 3.1 to 3.6; Chapter 4 – Sections: 4.1 and 4.2)

UNIT: III

NUMERICAL DIFFERENTIATION AND INTEGRATION: Differentiation with a Computer – Numerical Integration – The Trapezoidal Rule – Simpson's Rule – An Application of Numerical Integration – Fourier Series and Fourier Transforms – Adaptive Integration – Gaussian Quadrature – Multiple Integrals – Applications of Cubic Splines.

(Chapter 5 – Sections: 5.1 to 5.8.)

UNIT: IV

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: The Taylor-Series Method – The Euler Method and Its Modifications – Runge-Kutta Methods – Multistep Methods – Higher-order Equations and Systems – Stiff Equations – Boundary-Value Problems

(Chapter 6 – Sections: 6.1 to 6.7)

UNIT: V

PARTIAL DIFFERENTIAL EQUATIONS: Elliptic Equations – Parabolic Equations – Hyperbolic Equations.

FINITE-ELEMENT ANALYSIS: Mathematical Background-Finite Elements for Ordinary - Differential Equations – Finite Elements for Partial Differential Equations.

(Chapter 8 – Sections: 8.1 to 8.3; Chapter 9 – Sections: 9.1 to 9.3)

TEXT BOOK:

APPLIED NUMERICAL ANALYSIS – CURTIS F.GERALD and PATRICK O.WHEATLEY, Seventh Edition, Pearson Education Publisher, 2004.

REFERENCE BOOK:

NUMERICAL METHODS FOR ENGINEERS AND SCIENTISTS – J.N.SHARMA, Second Edition, Narosa Publishers, 2007.

Note: The MATLAB programmes are omitted in all the units.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	TOPOLOGY	II	18MMA21C

OBJECTIVES:

1. To understand the fundamental concepts of topological spaces.
2. To study continuous functions, connected and compact spaces.
3. To study complete metric and function spaces.

UNIT: I

TOPOLOGICAL SPACES: Topological spaces – Basis for a Topology – The order topology – The product topology on $X \times Y$ – The subspace topology – Closed sets and limit points.
(Chapter 2 – Sections: 12 to 17)

UNIT: II

CONTINUOUS FUNCTIONS: Continuous functions – The product topology – The metric topology and its continuation.
(Chapter 2 – Sections: 18 to 21)

UNIT: III

CONNECTEDNESS AND COMPACTNESS: Connected spaces – Connected subspace of the real line – Compact spaces – Compact subspace of real line and limit point compactness.
(Chapter 3 – Sections: 23, 24, 26 to 28)

UNIT: IV

COUNTABILITY AND SEPARATION AXIOMS: The countability axioms – The separation axioms – Normal spaces –The Urysohn lemma – The Urysohn metrization theorem.
(Chapter 4 – Sections: 30 to 34)

UNIT: V

THE TYCHONOFF THEOREM, COMPLETE METRIC SPACES AND FUNCTION SPACES: The Tychonoff theorem – The Stone-Cech compactification – Complete metric spaces – Compactness in metric spaces – Pointwise and compact convergence – Ascoli's theorem.
(Chapter 5 – Sections: 37, 38 and Chapter 7 – Sections: 43, 45 to 47)

TEXT BOOK:

TOPOLOGY – JAMES R. MUNKRES, Second Edition, Prentice Hall of India Private Limited, New Delhi, 2010.

REFERENCE BOOK:

INTRODUCTION TO TOPOLOGY AND MODERN ANALYSIS - G.F.SIMMONS, McGraw Hill International Edition, Second Reprint, 2004.

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Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	MEASURE AND INTEGRATION	II	18MMA22C

OBJECTIVES:

To teach the elements of Measure Theory and Lebesgue Integral, Differentiation and Integration and the classical Banach Space, it can be used for their higher studies, students must go through its application.

UNIT: I

LEBESGUE MEASURE: Introduction – Outer Measure – Measurable sets and Lebesgue measure – Measurable functions – Littlewood's three principles.
(Chapter 3 – Sections: 1 to 3, 5, 6)

UNIT: II

THE LEBESGUE INTEGRAL: The Lebesgue integral of a bounded function over a set of finite measure – The integral of a non-negative function – The general Lebesgue integral – Convergence in measure.
(Chapter 4 – Sections: 2 to 5)

UNIT: III

DIFFERENTIATION AND INTEGRATION: Differentiation of monotonic functions – Functions of bounded variation – Differentiation of an integral – Absolute continuity.
(Chapter 5 – Sections: 1 to 4)

UNIT: IV

DIFFERENTIATION AND INTEGRATION: Convex Functions
THE CLASSICAL BANACH SPACES: The L^p spaces – The Minkowski and Holder inequalities.
(Chapter 5 – Section: 5 and Chapter 6 – Sections: 1, 2)

UNIT: V

THE CLASSICAL BANACH SPACES: Convergence and completeness – Approximation in L^p – Bounded linear functional on the L^p spaces.
(Chapter 6 – Sections: 3 to 5)

TEXT BOOK:

REAL ANALYSIS – H.L.ROYDEN, Third Edition, Prentice Hall of India Private Limited, New Delhi, 2009.

REFERENCE BOOK:

MATHEMATICAL ANALYSIS – TOM M.APOSTOL, Third Edition, Addison Wesley, Narosa Indian Student Edition, 2002**.**

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	OPERATIONS RESEARCH	II	18MMA23C

OBJECTIVES:

To provide postgraduate students with a conceptual understanding of the role of management science using OR models given below. Students can learn how to take decisions for a management problems.

UNIT: I

DUAL SIMPLEX METHOD

REVISED SIMPLEX METHOD: Product form of the inverse – Steps of the primal revised method.

POST OPTIMAL ANALYSIS: Changes affecting feasibility – Changes affecting optimality.

PARAMETRIC LINEAR PROGRAMMING: Parametric changes in c – Parametric changes in b.

(Chapter 4 - 4.4 Section: 4.4.1, 4.5.1, 4.5.2; Chapter 7 - 7.2 Sections: 7.2.1, 7.2.2; and Chapter 7 - 7.5 Sections: 7.5.1, 7.5.2)

UNIT: II

SIMULATION: Monte-Carlo simulation – Types of simulation – Elements of discrete event simulation – Generation of random numbers – Mechanics of discrete simulation: Manual simulation of single server model.

(Chapter 16 - Sections: 16.1 to 16.4 and 16.5.1)

DECISION ANALYSIS: Decision making under certainty – Analytic hierarchy process. Decision making under risk – Decision tree based expected value criterion, Variations of the expected value criterion, Decision under uncertainty.

(Chapter 13 - Sections: 13.1 to 13.3)

UNIT: III

GAME THEORY: Optimal solution of two person zero sum game – Solution of mixed strategy games.

DYNAMIC PROGRAMMING: Recursive nature of computations in DP – Forward and backward recursion – Selected DP applications.

(Chapter 13 - Sections: 13.4; Chapter 10 - Sections: 10.1 to 10.3)

UNIT: IV

NON LINEAR PROGRAMMING: Introduction – Formulating a nonlinear programming problem (NLPP) – General nonlinear programming problem – Constrained optimization with equality constraints - Constrained optimization with inequality constraints.

(Chapter 27 - Sections: 27.1 to 27.5)

UNIT: V

NON LINEAR PROGRAMMING METHODS: Introduction – Graphical solution – Kuhn-Tucker conditions with non negative constraints – Quadratic programming – Wolfe's modified simplex method – Beale's method.
(Chapter 28 - Sections: 28.1 to 28.6)

TEXT BOOKS:

1. **OPERATIONS RESEARCH-AN INTRODUCTION –** HAMDY A. TAHA, Eighth Edition, Prentice Hall of India Private Limited, New Delhi. **(For Units I, II and III)**

2. OPERATIONS RESEARCH – KANTI SWARUP, P.K. GUPTA and MANMOHAN, Sultan Chand and Sons, Educational Publishers, New Delhi, Fourteenth Revised Edition.**(For Units IV and V)**

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	PARTIAL DIFFERENTIAL EQUATIONS	II	18MMA24C

OBJECTIVES:

On successful completion of the paper the students should have understood the fundamentals of PDE & Elliptic, Hyperbolic, Parabolic differential equations.

UNIT: I

PARTIAL DIFFERENTIAL EQUATIONS OF FIRST ORDER: Formation and solution of PDE – Integral surfaces – Cauchy problem for first order equations – Orthogonal surfaces – First order non-linear equations – Characteristics – Compatible systems of first order equations – Charpit's method.
(Chapter 0 – Sections: 0.4 to 0.11)

UNIT: II

FUNDAMENTALS: Introduction – Classification of Second order PDE – Canonical forms – Adjoint operators – Riemann's method.
(Chapter 1- Sections: 1.1 to 1.5)

UNIT: III

ELLIPTIC DIFFERENTIAL EQUATIONS: Derivation of Laplace and Poisson equations – BVP – Separation of Variables – Dirichlet Problem and Newmann problem for a rectangle – Solution of Laplace equation in Cylindrical and Spherical coordinates – Examples.
(Chapter 2 – Sections: 2.1, 2.2, 2.5, 2.6, 2.7, 2.11, 2.12)

UNIT: IV

PARABOLIC DIFFERENTIAL EQUATIONS: Formation and solution of diffusion equation – Dirac Delta function – Separation of variables method – Solution of Diffusion equation in Cylindrical and Spherical coordinates – Examples.
(Chapter 3 – Sections: 3.1, 3.3 to 3.7)

UNIT: V

HYPERBOLIC DIFFERENTIAL EQUATIONS: Formation and solution of one-dimensional wave equation – Canonical reduction – IVP; D'Alembert's solution – IVP and BVP for two-dimensional wave equations – Periodic solution of one-dimensional wave equation in cylindrical and spherical polar coordinate systems – Uniqueness of the solution for the wave equation – Duhamel's Principle – Examples.
(Chapter 4 – Sections: 4.1 to 4.4, 4.7 to 4.9, 4.11, 4.12)

TEXT BOOK:

1. **INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS** - K.SANKARA RAO, 2^{nd} Edition, Prentice Hall of India, New Delhi, 2005.

REFERENCE BOOKS:

1. **PARTIAL DIFFERENTIAL EQUATIONS** - R. C. MCOWEN, 2^{nd} Edition, Pearson Eduction, New Delhi, 2005.
2. **ELEMENTS OF PARTIAL DIFFERENTIAL EQUATIONS –** I.N.SNEDDON, Mc Graw hill, New Delhi, 1983.
3. **INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS AND BOUNDARY VALUE PROBLEMS** - R. DENNEMEYER, Mc Graw hill, New Delhi, 1968.
4. **ADVANCED DIFFERENTIAL EQUATIONS** - M. D. RAISINGHANIA, S. Chand and Company Ltd., New Delhi, 2001.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	NUMBER THEORY	II	18MMA25E

OBJECTIVES:

1. To give the students a thorough knowledge of the various aspects of Number Theory.
2. To highlight some of the applications of theory of numbers.

UNIT: I

DIVISIBILITY: Introduction – Divisibility – Primes.
(Chapter I - Sections: 1.1 to 1.3)

UNIT: II

CONGRUENCES: Congruences – Solutions of congruences – The Chinese Remainder theorem – Prime power moduli - Prime modulus.
(Chapter II - Sections: 2.1 to 2.3, 2.6, 2.7)

UNIT: III

PRIMITIVE ROOTS AND POWER RESIDUES: Primitive roots and power Residues – Congruences of Degree two, Prime Modulus - Number theory from an algebraic view point – Groups, Rings, and Fields.
(Chapter II - Sections: 2.8 to 2.11)

UNIT: IV

QUADRATIC RECIPROCITY AND QUADRATIC FORMS: Quadratic residues - Quadratic reciprocity – The Jacobi symbol – Binary Quadratic forms
(Chapter III – Sections: 3.1 to 3.4)

UNIT: V

SOME FUNCTIONS OF NUMBER THEORY: Greatest integer function - Arithmetic functions – The Mobius inversion formula – Recurrence functions – Combinatorial Number Theory – Some Diophantine Equations – The equation ax+by=c.
(Chapter IV - Sections: 4.1 to 4.5; Chapter V - Section: 5.1)

TEXT BOOK:

1. **AN INTRODUCTION TO THEORY OF NUMBERS** – IVAN NIVEN and HERBERT. S ZUCHERMAN, HUGH. L MONTGOMERY, Fifth Edition, Wiley Eastern Limited, New Delhi, 1972.

REFERENCE BOOKS:

1. **INTRODUCTION TO ANALYTIC NUMBER THEORY** – TOM M.APOSTOL, Springer Verlag, 1976.

2. **ELEMENTARY NUMBER THEORY AND ITS APPLICATIONS** – KENNETH and ROSAN, Addison Wesley Publishing Company, 1968.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	MECHANICS	III	18MMA31C

OBJECTIVES:

To study and develop the capacity to predict the effects of force and motion while carrying out the creative design function of engineering.

UNIT: I

INTRODUCTORY CONCEPTS: The mechanical system – Generalized co-ordinates – Constraints – Virtual work – Energy and momentum.
(Chapter 1 - Sections: 1.1 to 1.5)

UNIT: II

LAGRANGE'S EQUATIONS: Derivation of Lagrange's equations – Examples – Integrals of the motion – Small oscillations.
(Chapter 2 - Sections: 2 .1 to 2 .4)

UNIT: III

HAMILTON'S EQUATION: Hamilton's principle – Hamilton's equations – Phase space.
(Chapter 4 - Sections: 4.1, 4.2 and 4.4)

UNIT: IV

HAMILTON-JACOBI THEORY: Hamilton's principle function – The Hamilton-Jacobi equation – Separability.
(Chapter 5 - Sections: 5.1 to 5.3)

UNIT: V

INTRODUCTION TO RELATIVITY: Introduction – Relativistic kinematics – Relativistic dynamics.
(Chapter 7 - Sections: 7.1 to 7.3)

TEXT BOOK:

1. **CLASSICAL DYNAMICS** – DONALD T. GREENWOOD, Prentice Hall of India Private Limited, New Delhi, 1985.

REFERENCE BOOKS:

1. **CLASSICAL MECHANICS** – HERBERT GOLDSTEIN, Second Edition, Narosa Publishing House,1990.
2. **THEORETICAL MECHANICS** – MURRAY R. SPIEGEL, Tata McGraw Hill Education Private Limited, New Delhi, 2006.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	GRAPH THEORY	III	18MMA32C

OBJECTIVES:

1. To understand the basic concepts of Graph Theory.
2. To acquire the knowledge about the applications of some higher order Graphs.

UNIT: I

FUNDAMENTAL CONCEPTS: What is a graph - Paths, cycles and trails - Vertex degrees and counting

(Chapter 1- Sections: 1.1 to 1.3)

UNIT: II

TREES AND DISTANCE: Basic properties – Spanning trees and enumeration

(Chapter 2 - Sections: 2.1 and 2.2)

UNIT: III

MATCHINGS AND FACTORS: Matchings and covers - Matchings in general graphs

CONNECTIVITY AND PATHS: Cuts and connectivity - K-connected graphs.

(Chapter 3 - Sections: 3.1, 3.3; Chapter 4 - Sections: 4.1, 4.2)

UNIT: IV

COLORING OF GRAPHS: Vertex colorings and upper bounds - Structure of K-Chromatic graphs.

(Chapter 5 - Sections: 5.1 and 5.2)

UNIT: V

PLANAR GRAPHS: Embedding and Euler's formula.

EDGES AND CYCLES: Line graphs and edge coloring - Hamiltonian cycles.

(Chapter 6 - Section: 6.1; Chapter 7 - Sections: 7.1 and 7.2)

TEXT BOOK:

1. **INTRODUCTION TO GRAPH THEORY** – DOUGLAS B. WEST, Second Edition, PHI Learning Private Limited, New Delhi, 2009.

REFERENCE BOOKS:

1. **GRAPH THEORY** - NARSINGH DEO, Prentice Hall of India Private Limited, New Delhi, 1987
2. **GRAPH THEORY -** FRANK HARARY, Narosa Publishing House, New Delhi.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	FUNCTIONAL ANALYSIS	III	18MMA33C

OBJECTIVES:

1. To introduce Banach Spaces, which is a combination of both algebraic and metric structures and study the linear transformations on them.
2. To introduce Hilbert Spaces, a special type of Banach Spaces and study bounded linear operators on Hilbert Spaces.
3. To introduce Banach algebras and regular and singular elements

UNIT: I

BANACH SPACES: The definition and some examples – Continuous linear transformations – The Hahn Banach theorem.

(Chapter 9 - Sections: 46 to 48)

UNIT: II

The natural imbedding of N in N^{**} – The open mapping theorem – The conjugate of an operator.

(Chapter 9 - Sections: 49 to 51)

UNIT: III

HILBERT SPACES: The definition and some simple properties – Orthogonal complements – Orthonormal sets – The conjugate space H^{*}.

(Chapter 10 - Sections: 52 to 55)

UNIT: IV

The adjoint of an operator – Self adjoint operators – Normal unitary operators – Projections.

(Chapter 10 - Sections: 56 to 59)

UNIT: V

FINITE DIMENSIONAL SPECTRAL THEORY: Matrices – Determinants and the spectrum of an operator – The spectral theorem.

GENERAL PRELIMINARIES ON BANACH ALGEBRAS: The definition and some examples – Regular and Singular elements.

(Chapter 11 - Sections: 60 to 62; Chapter 12 – Sections: 64 to 65)

TEXT BOOK:

1. **INTRODUCTION TO TOPOLOGY AND MODERN ANALYSIS** – G.F.SIMMONS, Mc Graw Hill Education(India) Pvt Ltd, New Delhi, Edition 2004.

REFERENCE BOOKS:

1. **A FIRST COURSE IN FUNCTIONAL ANALYSIS** – C.GOFFMAN and G.PEDRICK, Prentice Hall of India, New Delhi, 1987.
2. **INTRODUCTION TO FUNCTIONAL ANALYSIS**– A.E.TAYLOR, John Wiley and Sons, New York, 1988.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	MATHEMATICAL STATISTICS	III	18MMA34C

OBJECTIVES:

1. To study random events and variables.
2. To understand the parameters of the distribution of a random variable.
3. To study characteristic functions, probability distributions and limit theorems.

UNIT: I

RANDOM EVENTS: The system of axioms of theory of probability – Conditional Probability – Baye's theorem – Independent events.

RANDOM VARIABLES: The concept of a random variable – The distribution function - Random Variables of the discrete type and the continuous type – Functions of random variables – Multidimensional random variables – Marginal distributions – Conditional distributions – Independent random variables.

(Chapter 1 - except Section: 1.4, Chapter 2 - Sections: 2.1 to 2.8)

UNIT: II

PARAMETERS OF THE DISTRIBUTION OF A RANDOM VARIABLE: Expected values – Moments – The Chebychev inequality – Absolute moments – Order parameters - Moments of random vectors - Regression of first type - Regression of Second type.

(Chapter 3 - Sections: 3.1 to 3.8)

UNIT: III

CHARACTERISTIC FUNCTIONS: Properties of characteristic functions – The characteristic functions and moments – Semi invariants - The characteristic function of the sum of independent random variables – Determinations of the distribution function by the characteristic function

SOME PROBABILITY DISTRIBUTIONS: One point and two point distributions – The Bernoulli scheme – The binomial distribution – The Poisson scheme – The generalized binomial distribution – The Poisson distribution – The uniform, Normal, Gamma, Beta, Cauchy and Laplace distributions.

(Chapter 4 - Sections: 4.1 to 4.5; Chapter 5 - Sections: 5.1 to 5.10 except 5.4)

UNIT: IV

LIMIT THEOREMS: Stochastic convergence – Bernoulli's law of large numbers – The Levy-Cramer theorem - De Moivre-Laplace theorem – The Lindeberg-Levy theorem – The Lapunov theorem.

(Chapter 6 - Sections: 6.1 to 6.9 except 6.5)

UNIT: V

SAMPLE MOMENTS AND THEIR FUNCTIONS : The notion of a sample – Notion of a statistic – Distribution of arithmetic mean of independent normally distributed random variables – The chi-square distribution – Distribution of the statistic ($\bar{X}$, s) – Student's t-distribution – Fisher's Z-distribution

SIGNIFICANCE TEST: The concept of a statistical test – Parametric tests for small samples - Parametric test for large samples – The chi-square test.

(Chapter 9 - Sections: 9.1 to 9.7; Chapter 12 - Sections: 12.1 to 12.4)

TEXT BOOK:

1. **PROBABILITY THEORY AND MATHEMATICAL STATISTICS** – MAREK FISZ, Third Edition, John Wiley and Sons, 1963.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	OBJECT ORIENTED PROGRAMMING WITH C++	III	18MMA35E

OBJECTIVES:

To understand object–oriented program design techniques and implementation of OOD in C++.

UNIT: I

Beginning with C++.
Tokens, Expressions and Control structures.
(Chapter 2 and Chapter 3)

UNIT: II

Functions in C++.
Constructors and Destructors.
(Chapter 4 and Chapter 6)

UNIT: III

Classes and Objects.
(Chapter 5)

UNIT: IV

Operators overloading and Type conversions.
Pointers, Virtual functions and polymorphism.
(Chapter 7 and Chapter 9)

UNIT: V

Inheritance: Extending Classes.
(Chapter 8)

TEXT BOOK:

1. **OBJECT ORIENTED PROGRAMMING WITH C++** – E. BALAGURUSAMY, Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2008.

REFERENCE BOOKS:

1. **OBJECT ORIENTED PROGRAMMING IN TURBO C++** – ROBERT LAFORE, Wate group, 1992.
2. **THE C++ PROGRAMMING LANGUAGE** – BJARNE STROUSTROUP, Addison Wesley, 1991.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	OPERATOR THEORY	IV	18MMA41C

OBJECTIVES:

1. To understand the concepts of bounded linear operators and partial isometry operators.
2. To study the concepts of polar decomposition, spectrum and numerical range of an operator.
3. To understand the properties of several classes of non normal operators and further development of bounded linear operators.

UNIT: I

FUNDAMENTAL PROPERTIES OF BOUNDED LINEAR OPERATORS: Bounded linear operator on a Hilbert space - Norm of bounded linear operator – Adjoint operator – Generalized polarization identity and its application – Several properties on projection operator – Generalized Schwarz inequality and square root of positive operator – Spectral representations of self adjoint operator.
(Chapter 2 - Section: 2.1)

UNIT: II

PARTIAL ISOMETRY OPERATOR: Partial isometry operator and its characterization

POLAR DECOMPOSITION OF AN OPERATOR: Invariant subspace and reducing subspace – Polar decomposition of non-normal operator – Hereditary property on the polar decomposition of an operator.
(Chapter 2 - Sections: 2.2 and 2.3)

UNIT: III

SPECTRUM OF AN OPERATOR: Two kinds of classification of spectrum – Spectral mapping theorem

NUMERICAL RANGE OF AN OPERATOR: Numerical range is a convex set – Numerical radius is equivalent to operator norm – The closure of numerical range includes the spectrum – Normaloid operator and spectraloid operator.
(Chapter 2 - Sections: 2.4 and 2.5)

UNIT: IV

RELATIONS AMONG SEVERAL CLASSES OF NON-NORMAL OPERATORS: Paranormal operators

CHARACTERIZATIONS OF CONVEXOID OPERATORS: some examples related to hyponormal, paranormal, normaloid and convexoid operators – Relations among several non-normal operators.
(Chapter 2 - Sections: 2.6 and 2.7)

UNIT: V

FURTHER DEVELOPMENT OF BOUNDED LINEAR OPERATORS: Young inequality and Holder – McCarthy inequality – Löwner-Heinz Inequality and Furuta Inequality – chaotic order and the Relative operator Entropy- Aluthge transformation on p-hyponormal operators and log-hyponormal operators.
(Chapter 3 - Sections: 3.1 to 3.4)

TEXT BOOK:

INVITATION TO LINEAR OPERATORS – TAKAYUKI FURUTA, Taylor and Francis Group, 2001.

REFERENCE BOOK:

HILBERT SPACE PROBLEM BOOK – P.R.HALMOS, Springer Verlag, New York.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	FLUID DYNAMICS	IV	18MMA42C

OBJECTIVES:

1. To understand the mechanism of Fluids.
2. To highlight some of the real life application in different situations.

UNIT: I

KINEMATICS OF FLUIDS: Methods of describing fluid motion; Lagrangian method – Eulerian method – Translation, Rotation and rate of deformation – Stream lines, path lines and streak lines –The Material derivatives and acceleration – Vorticity.

FUNDAMENTAL EQUATIONS OF THE FLOW OF VISCOUS COMPRESSIBLE FLUIDS: The equation of continuity – Conservation of mass – The equation of motion – Conservation of momentum, The equation of energy – Conservation of energy,

(Chapter 3 - Sections: 3.1, 3.1a, 3.1b, 3.2, 3.3a, 3.3b, 3.3c, 3.4, 3.5 and Chapter 5 - Sections: 5.1 to 5.3)

UNIT: II

ONE DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW: The equation of continuity –Stream tube flow; equation of motion – Euler's equation – The Bernoulli's equation – Flow from a tank through a small orifice – Trajectory of a free jet – The momentum theorem.

TWO AND THREE DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW: Equation of continuity – Eulerian equation of motion - Circulation theorem (Kelvin's) – Velocity potential – Irrotational flow – Integration of the equations of motion – Bernoulli's equation – The momentum theorem – The moment of momentum theorem.

(Chapter 6 - Sections: 6.1 to 6.3, 6.4a, 6.4b, 6.6 and Chapter 7 – Sections: 7.1, 7.2, 7.3a, 7.3b, 7.3c, 7.4, 7.5, 7.5a, 7.5b, 7.6, 7.7)

UNIT: III

Laplace equation – Boundary conditions – Stream function in two dimensional motion – The flow net – Stream function in three dimensional motion – two dimensional flow examples – Rectilinear flow – Source and sink – Radial flow – Vortex flow – Doublet – Three dimensional axially symmetric flow –Uniform flow – Radial flow – Radial flow (source or sink) – Doublet.

(Chapter 7 - Sections: 7.8a, 7.8b, 7.9 to7.11, 7.12a, 7.12b, 7.12c, 7.12d, 7.13a, 7.13b, 7.13c)

UNIT: IV

LAMINAR FLOW OF VISCOUS INCOMPRESSIBLE FLUIDS: Similarity of flows – The Reynolds number – Flow between parallel flat plates – Coutte flow – Plane Poiseuille flow – Steady flow in pipes – Flow through a pipe – The Hagen-Poiseuille flow – Flow between coaxial cylinders.

(Chapter 8 - Sections: 8.1, 8.3, 8.3a, 8.3b, 8.4a and 8.4b)

UNIT: V

BOUNDARY LAYER THEORY: Properties of the Navier–Stokes Equations - Boundary layer concept – The Boundary layer equations in two dimensional flow – The Boundary layer along a flat plate – The Blasius solution – Shearing Stress and Boundary layer thickness – Boundary layer on a surface with pressure gradient – Momentum integral theorem for the boundary layer – The Von Karman Integral Relation.

(Chapter 9 - Sections: 9.1, 9.2, 9.3a, 9.3b, 9.4, 9.5a)

TEXT BOOK:

FOUNDATION OF FLUID MECHANICS – S.W.YUAN, Prentice Hall of India Private Limited.

REFERENCE BOOK:

INTRODUCTION TO FLUID MECHANICS – G.K.BATCHALOR, Cambridge University Press.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	FUZZY LOGIC AND FUZZY SETS	IV	18MMA43C

OBJECTIVES:

1. To understand the basic concepts of crisp sets and Fuzzy sets.
2. To study the Fuzzy relations and Fuzzy measures.
3. To enable the students to apply the concepts of Fuzzy logic in their Natural life.

UNIT: I

CRISP SETS AND FUZZY SETS: The notion of Fuzzy sets – Basic concepts.
OPERATIONS ON FUZZY SETS: Fuzzy Complement – Fuzzy Union – Fuzzy Intersection – Combination of operations – General aggregation operations.
(Chapter 1 - Sections: 1.3 and 1.4; Chapter 2 - Sections: 2.2 to 2.6)

UNIT: II

FUZZY RELATIONS: Crisp and Fuzzy relations – Binary relations on a single set – Equivalence and similarity relation – Compatibility or tolerance relations – Orderings, Morphisms, Fuzzy relation equations.
(Chapter 3 - Sections: 3.1 to 3.8)

UNIT: III

FUZZY MEASURES: General discussion – Belief and Plausibility measures – Probability measures – Possibility and Necessity measures – Relation among classes of fuzzy measures.
(Chapter 4 - Sections: 4.1 to 4.5)

UNIT: IV

UNCERTAINTY AND INFORMATION: Types of uncertainty – Measures of fuzziness, Classical measures of uncertainty – Measures of dissonance – Confusion and non specificity.
(Chapter 5 – Sections: 5.1 to 5.6)

UNIT: V

APPLICATIONS: General discussion – Natural life and Social Sciences – Management and Decision making – Computer Science.
(Chapter 6 - Sections: 6.1, 6.2, 6.5, 6.6)

TEXT BOOK:

1. **FUZZY SETS, UNCERTAINTY AND INFORMATION** – GEORGE J.KLIR and TINA A.FOLGER, Prentice Hall of India, New Delhi, 2007.

REFERENCE BOOK:

1. **FUZZY SETS AND FUZZY LOGIC THEORY AND APPLICATIONS** – GEORGE J.KLIR AND BO YUAN, Prentice Hall of India, New Delhi, 2006.
2. **FUZZY LOGIC WITH ENGINEERING APPLICATIONS** - Timothy J. ROSS WILLEY, India Pvt. Ltd., New Delhi, Second Edition Reprint, 2009.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS	IV	18MMA44C

OBJECTIVES:

1. To impart analytical ability in solving variational problems and Integral equations.
2. To formulate variational problems and analyze them to deduce key properties of system behavior.
3. To be exposed to different types of integral equations.

UNIT: I

VARIATIONAL PROBLEMS WITH FIXED BOUNDARIES: The concept of variation and its properties – Euler's equation – Variational problems for functional – Functional dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of mechanics
(Chapter 1 - Sections: 1.1 to 1.5 and 1.7)

UNIT: II

VARIATIONAL PROBLEMS WITH MOVING BOUNDARIES: Variational problem with a movable boundary for a functional dependent on two functions - One-sided variations - Reflection and Refraction of extremals - Diffraction of light rays.
(Chapter 2 – Section: 2.2 to 2.5)

UNIT: III

INTEGRAL EQUATIONS: Introduction – Types of Kernels - Eigen Values and Eigen function – Connection with differential equation – Solution of Integral Equation – Initial Value Problems - Boundary value problems.
(Chapter 1 - Sections: 1.1 to 1.3 and 1.5 to 1.8)

UNIT: IV

SOLUTION OF FREDHOLM INTEGRAL EQUATIONS: Second kind with separable kernel- Orthogonality and reality of Eigen functions - Fredholm Integral Equation with separable kernel - Solution of Fredholm integral equation of the second kind by successive substitution and Approximation - Solution of Volterra integral equation of the second kind by successive substitution and Neumann series.
(Chapter 2 - Sections: 2.1 to 2.3 and Chapter 4 - Sections: 4.1 to 4.4, 4.7)

UNIT: V

HILBERT-SCHMIDT THEORY: Complex Hilbert space - Orthonormal system of functions – Gram-Schmidt orthogonalization process - Hilbert – Schmidt theorem- Solution of Fredholm Integral Equation of First kind.

(Chapter 3 - Section 3.1 to 3.4 and 3.8, 3.9)

TEXT BOOKS:

1. **CALCULUS OF VARIATIONS WITH APPLICATION -** A.S. GUPTA, PHI Learning Pvt Ltd, New Delhi, 2011.
2. **INTEGRAL EQUATIONS AND BOUNDARY VALUE PROBLEMS** - SUDIR K.PUNDIR and RIMPLE PUNDIR, Pragati Prakasam, Meerut, 2005.

REFERENCE BOOKS:

1. **METHODS OF APPLIED MATHEMATICS -** F.B. HILDEBRAND, Prentice-Hall of India Pvt. New Delhi, 1968.
2. **LINEAR INTEGRAL EQUATIONS -** R.P. KANWAL, Theory and Techniques, Academic press, New York, 1971.
3. **DIFFERENTIAL EQUATIONS AND CALCULUS OF VARIATIONS** - L.ELSGOLTS, Mir Publications, Moscow, 1973.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	MAT LAB	IV	18MMA45E

OBJECTIVES:

Introducing a software package for high–performance numerical computation and visualization. It provides an interactive environment with hundreds of built-in functions for Technical computation, graphics and animation.

UNIT: I

Basics of MATLAB – Creating and working with arrays of numbers – Creating and printing simple plots – Creating, saving and executing a script file – Creating and executing a function file – Working with arrays and matrices – Working with anonymous functions – Symbolic computation.
(Chapter 1 - Section: 1.6 and Chapter 2 - Sections: 2.1 to 2.8)

UNIT: II

Matrices and vectors – Matrix and array operations – Character strings – A special note on array operations – Command line functions – Using built-in functions and online help – Saving and loading data – Plotting simple graphs.
(Chapter 3 - Sections: 3.1 to 3.8)

UNIT: III

Script files – Function files – Language - specific features – Advanced data objects.
(Chapter 4 - Sections: 4.1 to 4.4)

UNIT: IV

Applications – Linear algebra – Curve fitting and interpolation – Data analysis and statistics – Numerical integration – Ordinary Differential Equations – Non-linear algebraic equations.
(Chapter 5 - Sections: 5.1 to 5.6)

UNIT: V

Basic 2-D plots – Using subplot for multiple graphs – The symbolic math tool box – Numeric versus symbolic computation – Getting help with the symbolic math tool box.
(Chapter 6 - Sections: 6.1 to 6.2; Chapter 8 - Sections: 8.1 to 8.4)

TEXT BOOK:

1. **GETTING STARTED WITH MATLAB, UPDATED FOR VERSION 7.8** – RUDRA PRATAP, Oxford University Press, 2010.

REFERENCE BOOKS:

1. **MATLAB, AN INTRODUCTION WITH APPLICATIONS** – AMOS GILAT, Wiley Student Edition.
2. **NUMERICAL COMPUTING WITH MATLAB** – CLEVE B.MOLER, Web Edition, Published by the Mathworks, Inc.

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE (FOR MCA)	I	18MCA15C

OBJECTIVES:

1. To highlight some of the applications of Mathematics.
2. The students are expected to grasp the basic concepts of Discrete Mathematics, Vector and Numerical solutions of equations.

UNIT: I

MATHEMATICAL LOGIC: Introduction – Statements and Notation – Connectives - Negation – Conjunction – Disjunction – Statement Formulas and Truth Tables – Conditional and Biconditional - Tautology - Equivalence of formulas – Duality Law Tautological Implications - Normal forms - Disjunctive Normal Forms - Conjunctive Normal Forms - Principal Disjunctive Normal Forms - Principal Conjunctive Normal Forms.

(Chapter1 - Sections: 1.1 to 1.2 - 1.2.1 to 1.2.4, 1.2.6, 1.2.8 to 1.2.11, 1.3 - 1.3.1 to 1.3.4)

UNIT: II

THEORY OF INFERENCE FOR STATEMENT CALCULUS AND PREDICATE CALCULUS: Validity using Truth tables – Rules of Inference – Consistency of Premises and Indirect Method of proof – The Predicate Calculus – Predicates – The statement Function, Variables and Quantifiers – Predicate Formulas – Free and Bound Variables – Theory of Inference for the predicate calculus.

(Chapter 1 - Sections: 1.4 - 1.4.1 to 1.4.3, 1.5 – 1.5.1 to 1.5.4, 1.6 – 1.6.4)

UNIT: III

VECTOR ALGEBRA: Definition – Addition and subtraction of vectors – Position vector – Composition of vectors – Rectangular unit vectors – Vector product – Scalar product – Cross product – Scalar triple product – Vector triple product.

(Chapter 8 - Sections 1 to 8)

UNIT: IV

THE SOLUTION OF NUMERICAL ALGEBRAIC AND TRANSCENDENTAL EQUATIONS: Bisection method - Iteration method – Regular falsi method - Newton-Raphson method.

(Chapter 3 - Sections: 3.1 to 3.4)

UNIT: V

SOLUTION OF SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS: Direct method: Gauss elimination method - Gauss Jordon method.
Indirect method: Gauss Jacobi method - Gauss Seidel method of iteration.
(Chapter 4 - Sections: 4.1, 4.2, and 4.7 to 4.9)

TEXT BOOKS:

1. **DISCRETE MATHEMATICAL STRUCTURES WITH APPLICATIONS TO COMPUTER SCIENCE** - J.P.TREMBLAY and R.MANOHAR, Tata McGraw Hill Publishing Company Limited, 38th Reprint 2010. **(For Units I and II)**
2. **ANCILLARY MATHEMATICS VOL II** – S.NARAYANAN, R.HANUMANTHA RAO and T.K.MANICAVACHAGOM PILLAY, S.Viswanathan Printers and Publishers Pvt Ltd, 2011 – 2013**.** **(For Unit III)**
3. **NUMERICAL METHODS -** K.P.KANDASAM, Dr.K.THILAGAVATHY and Dr.K.GUNAVATHY, S Chand and Company Limited, New Delhi, Reprint 2002.**(For Units IV and V)**

REFERENCE BOOK:

1. **DISCRETE MATHEMATICS WITH GRAPH THOERY AND COMBINATORICS** - T. VEERARAJAN, Tata McGraw Hill Publishing Company, New Delhi, Fifth Reprint, 2008

Year	Subject Title	Sem.	Sub. Code
2018-19 Onwards	OPERATIONS RESEARCH (For MCA)	II	18MCA25C

OBJECTIVES:

1. To Solve Linear Programming Problems and Primal – Dual problems.
2. To understand the various replacement models in Operations Research.
3. To understand the concepts of Queuing Theory and Network scheduling by PERT/CPM.

UNIT: I

LINEAR PROGRAMMING PROBLEM: Formulation of L.P.P – Graphical solutions of L.P.P – Simplex Method - Charnes Penalty Method (or) Big–M Method – Duality in L.P.P – Primal and Dual Problems.

(Chapter 2 - Sections: 2.1 to 2.4; Chapter 3 - Sections: 3.1 and 3.2; Chapter 4 - Sections: 4.1 to 4.4; Chapter 5 - Sections: 5.1 to 5.4)

UNIT: II

THE TRANSPORTATION PROBLEM: General transportation problem - Basic feasible solution by LCM – NWC – VAM – Optimum solutions – Unbalanced-Transportation problems - The Assignment problems – Introduction – Mathematical formulation – Hungarian assignment method.

(Chapter 10 - Sections: 10.1 to10.10, 10.13; Chapter 11 - Sections: 11.1 to 11.3)

UNIT: III

REPLACEMENT MODEL: Introduction – Replacement of items that deteriorates gradually - Value of money does not change with time - Value of money changes with time - Replacement of items that fails suddenly - Individual Replacement - Group replacement.

(Chapter 18 - Sections: 18.1 to 18.3)

UNIT: IV

NETWORK SCHEDULING BY PERT/CPM: Introduction - Network and basic component - Rules of network construction – time calculation in Networks - CPM PERT - PERT calculations.

(Chapter 25 - Sections: 25.1 to 25.8)

UNIT: V

QUEUING THEORY: Introduction - Characteristics of Queuing system- Problems from single server: finite and infinite population model - Problems from multi server: finite and infinite Population model.

(Chapter 21 - Sections: 21.1 to 21.9)

TEXT BOOK:

1. **OPERATIONS RESEARCH -** KANDISWARUP, P.K.GUPTA and MAN MOHAN, Fourteenth Revised Edition, S Chand & Sons education Publications, New Delhi, Reprint 2009

REFERENCE BOOKS:

1. **OPERATIONS RESEARCH - AN INTRODUCTION** – HAMDY A.TAHA, Seventh Edition, Pearson Education, Reprint 2005.
2. **INTRODUCTION TO OPERATIONS RESEARCH** - FREDRICK S.HILLIER GERALD J.LIEBERMAN, Seventh Edition, Tata McGraw Hill Publishing Company Limited, Reprint 2001.
3. **OPERATIONS RESEARCH THEORY AND APPLICATIONS** - J.K.SHARMA, Second Edition, Macmillan India Limited, Reprint 2003.
4. **PROBLEMS IN OPERATIONS RESEARCH** – P.K.GUPTA and D.S.HIRA, Third Edition, S Chand and Company Limited, Reprint 2005