C. Abdul Hakeem College (Autonomous), Melvisharam.
Affiliated to Thiruvalluvar University, Vellore.
Re-accredited by NAAC with 'A' Grade.
Hakeem Nagar, Melvisharam – 632 509, Vellore District.

MASTER OF SCIENCE | MATHEMATICS
DEGREE COURSE | UNDER CBCS
(with effect from 2018-2019)

Year/ Semester	Subjects	Subject Codes	Title of the Papers	Ins Hrs/ week	Credit	Exam Hrs	Max. Marks		
							Int	Ext	Total
I Year ISEM	Core I	P18MMA101	Algebra	6	6	3	25	75	100
	Core II	P18MMA102	Real Analysis I	6	5	3	25	75	100
	Core III	P18MMA103	Ordinary Differential Equations	6	4	3	25	75	100
	Core IV	P18MMA104	Mechanics	6	4	3	25	75	100
	Elective I	P18EMA101	(To Choose 1 out of 3) A. Graph Theory B. **Fuzzy Mathematics** C. Formal Languages & Automata Theory	6	3	3	25	75	100
			Total		**22**				**500**
I Year IISEM	Core V	P18MMA201	Real Analysis - II	6	5	3	25	75	100
	Core VI	P18MMA202	Partial Differential Equations	6	4	3	25	75	100
	Core VII	P18MMA203	Calculus of Variations and Integral Equations	5	4	3	25	75	100
	Core VIII	P18MMA204	Mathematical Programming	6	4	3	25	75	100
	Elective II	P18EMA201	(To Choose 1 out of 3) A. **Difference Equations** B. Analytic Number Theory C. Acturial Mathematics	5	3	3	25	75	100
	Compulsory	P18CHR201	Human Rights	2	2	3	25	75	100
			Total		**22**				**600**

C. Abdul Hakeem College (Autonomous), Melvisharam.

Syllabus for M.Sc., Mathematics effective from the year 2018-2019

Year:	I Year	Subject Code :	P18MMA101	Semester :	I
Major - 1	Title:	**ALGEBRA**			
Credits:	5			Max. Marks. 75	

UNIT-I: GROUP THEORY

Another Counting Principle - Sylow's theorem
Chapter 2: Sections 2.11 and 2.12
(Omit Second and Third Proof of Sylow's Theorem)(Omit Lemma 2.12.5)

UNIT-II: FIELDS

Extension fields - Transcendence of e - Roots of Polynomials.
Chapter 5: Section 5.1, 5.2 and 5.3.

UNIT-III: FIELDS

More about Roots - Elements of Galois theory.
Chapter 5 : Section 5.5 and 5.6

UNIT-IV:

FIELDS: Solvability of Radicals.
FINITE DIVISION RINGS: Wedderburn's theorem.
GROUP THEORY: Direct products - Finite Abelian groups.
Chapter 5: Section 5.7 (Lemma 5.7.1, Lemma 5.7.2, Theorem 5.7.1)
Chapter 7: Section 7.2 (For Theorem 7.2.1 First Proof Only)
Chapter 2: Sections 2.13 and 2.14 (Only Theorem 2.14.1)

UNIT-V:LINEAR TRANSFORMATIONS

Canonical Forms: Nilpotent Transformations - A Decomposition of a Vector Space: Jordan Form -Rational Canonical form.
Chapter 6: Sections 6.5, 6.6 and 6.7

Recommended Text:

I.N. Herstein. Topics in Algebra (II Edition) Wiley Eastern Limited, New Delhi, 1975.

Reference Books:

1. M.Artin, Algebra, Prentice Hall of India, 1991.

2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, Basic Abstract Algebra (II Edition) Cambridge University Press, 1997. (Indian Edition)

3. I.S.Luther and I.B.S.Passi, Algebra, Vol. I –Groups(1996); Vol. II Rings, Narosa Publishing House , New Delhi, 1999

4. D.S.Malik, J.N. Mordeson and M.K.Sen, Fundamental of Abstract Algebra, McGraw Hill (International Edition), New York. 1997.

5. N.Jacobson, Basic Algebra, Vol. I & II W.H.Freeman ; also published by Hindustan Publishing Company, New Delhi, 1980.

C. Abdul Hakeem College (Autonomous), Melvisharam.

Syllabus for M.Sc., Mathematics effective from the year 2018-2019

Year:	I Year	Subject Code :	P18MMA102	Semester :	I
Major - 2	Title:	**REAL ANALYSIS I**			
Credits:	5			Max. Marks. 75	

UNIT-I: FUNCTIONS OF BOUNDED VARIATION

Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of increasing functions - Continuous functions of bounded variation.
Chapter - 6 : Sections 6.1 to 6.8

UNIT-II: THE RIEMANN - STIELTJES INTEGRAL

Introduction - Notation - The definition of the Riemann - Stieltjes integral - Linear Properties - Integration by parts- Change of variable in a Riemann - Stieltjes integral - Reduction to a Riemann Integral - Setp 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.
Chapter - 7: Sections 7.1 to 7.13

UNIT-III: THE RIEMANN-STIELTJES INTEGRAL

Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals-Necessary conditions for the existence of Riemann-Stieltjes integrals- Mean value theorems for Riemann - Stieltjes integrals - The integrals as a function of the interval - Second fundamental theorem of integral calculus-Change of variable in a Riemann integral-Second Mean Value Theorem for Riemann integral-Riemann-Stieltjes integrals depending on a parameter-Differentiation under the integral sign – Interchanging the order of Integration.
Chapter - 7: 7.15 to 7.25

UNIT-IV: INFINITE SERIES AND INFINITE PRODUCTS

Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series - Double sequences - Double series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series - Cesarosummability - Infinite products.
Chapter 8: Sections 8.8, 8.15, 8.17, 8.18, 8.20, 8.21 to 8.26

UNIT-V: 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 condition for uniform convergence - Uniform convergence of infinite series of functions - Uniform convergence and Riemann - Stieltjes integration - Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series - Mean convergence.

Chapter – 9: Sec 9.1 to 9.6, 9.8, 9.10,9.11, 9.13

Recommended Text:

Tom M. Apostol :Mathematical Analysis, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1997.

Reference Books:

1. Bartle, R.G. Real Analysis, John Wiley and Sons Inc., 1976.

2. Rudin,W. Principles of Mathematical Analysis, 3rd Edition. McGraw Hill Company, New York, 1976.

3. Malik,S.C. and Savita Arora. Mathematical Anslysis, Wiley Eastern Limited.New Delhi, 1991.

4. Sanjay Arora and Bansi Lal, Introduction to Real Analysis, Satya Prakashan, New Delhi, 1991.

5. A.L.Gupta and N.R.Gupta, Principles of Real Analysis, Pearson Education, (Indian print) 2003.

C. Abdul Hakeem College (Autonomous), Melvisharam.

Year: I Year Subject Code : P18MMA103 Semester : I

Major - 3 Title: **ORDINARY DIFFERENTIAL EQUATIONS**

Credits: 4 Max. Marks. 75

UNIT-I: LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS

Introduction - Second order homogeneous equation-Initial value problems-Linear dependence and independence - Wronskian and a formula for Wronskian -Non-homogeneous equation of order two.

Chapter - 2: Sections 1 to 6

UNIT- II: LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS

Homogeneous equation of order n - Initial value problems for n^{th} order equations - Equations with real Constant - non-homogeneous equation of order n -Annihilator method to solve non-homogeneous equation - Algebra of constant coefficient operators.

Chapter - 2: Sections 7 to 12.

UNIT- III: LINEAR EQUATION WITH VARIABLE COEFFICIENTS

Introduction - Initial value problems - Existence and uniqueness theorems - Solutions of the homogeneous equations - Wronskian and linear Independence - Reduction of the order of a homogeneous equation - Solutions of the non-homogeneous equations- homogeneous equation with analytic coefficients -The Legendre equation.

Chapter – 3: Sections 1 to 8 (Omit section 9)

UNIT- IV: LINEAR EQUATION WITH REGULAR SINGULAR POINTS

Introduction - Euler equation - Second order equations with regular singular points, an example and the general case -Exceptional cases –The Bessel equation.

Chapter 4: Sections 1 to 4 and 6 to 8 (Omit sections 5 and 9)

UNIT-V: EXISTENCE AND UNIQUENESS OF SOLUTIONS TO FIRST ORDER EQUATIONS

Introduction - Equation with variable separated - Exact equations - Method of successive approximations - the Lipschitz condition - convergence of the successive approximations and the existence theorem.

Chapter 5: Sections 1 to 6 (Omit Sections 7 to 9)

Recommended Text:

Earl A.Coddington, An introduction to ordinary differential equations (3rd Reprint) Prentice-Hall of India Ltd.,New Delhi, 2012.

Reference Books:

1. Williams E. Boyce and Richard C. DI Prima, Elementary differential equations and boundary value problems, John Wiley and sons, New York, 1967.

2. George F Simmons, Differential equations with applications and historical notes, Tata McGraw Hill, New Delhi, 1974.

3. N.N. Lebedev, Special functions and their applications, Prentice Hall of India, New Delhi, 1965.

4. W.T. Reid. Ordinary Differential Equations, John Wiley and Sons, New York, 1971

5. M.D.Raisinghania, Advanced Differential Equations, S.Chand& Company Ltd. New Delhi 2001

6. B.Rai, D.P.Choudary and H.I. Freedman, A Course in Ordinary Differential Equations, Narosa Publishing House, New Delhi, 2002.

Major - 4 Title: **MECHANICS**

Credits: 4 Max. Marks. 75

UNIT-I: MECHANICAL SYSTEMS

The Mechanical system - Generalised coordinates - 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 themotion.
Chapter 2 : Sections 2.1 to 2.3 (Omit Section 2.4)

UNIT-III: HAMILTON'S EQUATIONS

Hamilton's Principle - Hamilton's Equations - Other variational principles.
Chapter 4 : Sections 4.1 to 4.3 (Omit section 4.4)

UNIT-IV: HAMILTON-JACOBI THEORY

Hamilton’s Principle function - Hamilton-Jacobi Equation - Separability
Chapter 5 : Sections 5.1 to 5.3

UNIT-V : CANONICAL TRANSFORMATIONS

Differential forms and generating functions - Special Transformations - Lagrange and Poisson brackets.
Chapter 6 : Sections 6.1, 6.2 and 6.3 (omit sections 6.4, 6.5 and 6.6)

Recommended Text

D. T. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.

Reference Books

1. H. Goldstein, Classical Mechanics, (2nd Edition) Narosa Publishing House, New Delhi.
2. N.C.Rane and P.S.C.Joag, Classical Mechanics, Tata McGraw Hill, 1991.
3. J.L.Synge and B.A.Griffth, Principles of Mechanics (3rd Edition) McGraw Hill Book Co., New York, 1970.

Elective -1 Title: GRAPH THEORY

Credits: 3 Max. Marks. 75

UNIT-I: GRAPHS, SUBGRAPHS AND TREES

Graphs and simple graphs - Graph Isomorphism - The Incidence and Adjacency Matrices - Subgraphs - Vertex Degrees - Paths and Connection - Cycles - Trees - Cut Edges and Bonds - Cut Vertices.

Chapter 1: (Section 1.1 - 1.7) ; Chapter 2: (Section 2.1 - 2.3)

UNIT-II: CONNECTIVITY, EULER TOURS AND HAMILTON CYCLES

Connectivity - Blocks - Euler tours - Hamilton Cycles.

Chapter 3: (Section 3.1 - 3.2) ; Chapter 4: (Section 4.1 - 4.2)

UNIT-III: MATCHINGS, EDGE COLOURINGS

Matchings - Matchings and Coverings in Bipartite Graphs - Edge Chromatic Number - Vizing's Theorem.

Chapter 5: (Section 5.1 - 5.2) ; Chapter 6: (Section 6.1 - 6.2)

UNIT-IV: INDEPENDENT SETS AND CLIQUES, VERTEX COLOURINGS

Independent sets - Ramsey's Theorem - Chromatic Number - Brooks' Theorem - Chromatic Polynomials.

Chapter 7: (Section 7.1 – 7.2); Chapter 8: (Section 8.1 – 8.2, 8.4)

UNIT-V: PLANAR GRAPHS

Plane and planar Graphs - Dual graphs - Euler's Formula - The Five-Colour Theorem and the Four-Colour Conjecture.

Chapter 9: (Section 9.1 - 9.3, 9.6)

Recommended Text

J.A.Bondy and U.S.R. Murthy, Graph Theory and Applications, Macmillan, London, 1976.

Reference Books

1. J.Clark and D.A.Holton , A First look at Graph Theory, Allied Publishers, New Delhi, 1995.
2. R. Gould. Graph Theory, Benjamin/Cummings, Menlo Park, 1989.
3. A.Gibbons, Algorithmic Graph Theory, Cambridge University Press, Cambridge, 1989.
4. R.J.Wilson and J.J.Watkins, Graphs : An Introductory Approach, John Wiley and Sons, New York, 1989.
5. R.J. Wilson, Introduction to Graph Theory, Pearson Education, 4th Edition, 2004, Indian Print.
6. S.A.Choudum, A First Course in Graph Theory, MacMillan India Ltd. 1987.

Elective - 1 Title: **FUZZY MATHEMATICS**

Credits: 3 Max. Marks. 75

UNIT - I: FUZZY SETS

Fuzzy sets: Basic Types - Basic concepts - Characteristics and Significance of the paradigm shift - Additional properties of α-cuts.
Chapter 1: Sections 1.3 to 1.5 and Chapter 2 : Section 2.1

UNIT - II: FUZZY SETS VERSUS CRISP SETS

Representation ofFuzzy sets - Extension principle for Fuzzy sets - Types of operations - Fuzzy complements.
Chapter 2: Sections 2.2 and 2.3 and Chapter 3 : Sections 3.1 and 3.2

UNIT - III: OPERATIONS ON FUZZY SETS

Fuzzy intersections: t-norms - Fuzzy unions: t-conorms - Combinations of operations - Aggregation operations.
Chapter 3: Sections 3.3 to 3.6

UNIT - IV: FUZZY ARITHMETIC

Fuzzy numbers – Linguistic variables – Arithmetic operation on intervals and Fuzzy numbers – Lattice of Fuzzy numbers.
Chapter 4: Sections 4.1 to 4.5

UNIT - V:FUZZY RELATIONS

Crisp and Fuzzy Relations – Projections and Cylindric Extensions - Binary Fuzzy Relations – Binary Relations on a Single Set – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Ordering Relations - Fuzzy Morphisms – Sup-iCompositions of Fuzzy Relations – Inf-w_iCompositions of Fuzzy Relations.
Chapter 5: Sections 5.1 to 5.10

Recommended Text:

G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI, New Delhi, 2007.

Reference Books:

1. H. J. Zimmerman, Fuzzy Set Theory and its Applications, Allied Publishers, 1996.

2. A. Kaufman, Introduction to the theory of Fuzzy Subsets, Academic Press, 1975.

3. V. Novak, Fuzzy Sets and their Applications, Adam Hilger, Bristol, 1969.

C. Abdul Hakeem College (Autonomous), Melvisharam.

Elective - 1 Title: FORMAL LANGUAGES AND AUTOMATA THEORY

Credits: 5 Max. Marks. 75

UNIT-I:

Finite automata, regular expressions and regular grammars

Finite state systems – Basic definitions – Nondeterministic finite automata – Finite automata with ε moves – Regular expressions – Regular grammars.
Chapter 2: Sections 2.1 to2.5
Chapter 9: Section 9.1

UNIT-II: Properties of regular sets.

The Pumping lemma for regular sets – Closure properties of regular sets – Decision algorithms for regular sets – The Myhill-Nerode Theorem and minimization of finite automata.
Chapter 3 : Sections 3.1 to 3.4

UNIT-III: Context-free grammars

Motivation and introduction – Context-free grammars – Derivation trees-Simplification of context-free grammars – Chomsky normal form – Greibach normal form.
Chapter 4: Section 4.1 to 4.6

UNIT-IV:Pushdown automata

Informal description – Definitions-Pushdown automata and context-free languages - Normal forms for deterministic pushdown automat.
Chapter 5: Sections 5.1 to 5.3

UNIT-V: Properties of context-free languages

The pumping lemma for CFL's - Closure properties for CFL's - Decision algorithms for CFL's.
Chapter 6: Sections 6.1 to 6.3

Recommended Text:

John E.Hopcraft and Jeffrey D.Ullman, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, New Delhi, 1987.

Reference Books:

1. A. Salomaa, Formal Languages, Academic Press, New York, 1973.
2. John C. Martin, Introduction to Languages and theory of Computations (2nd Edition) Tata-McGraw Hill Company Ltd., New Delhi, 1997.

C. Abdul Hakeem College (Autonomous), Melvisharam.

Syllabus for M.Sc.,Mathematics effective from the year 2018-2019

Year: I Year Subject Code : P18MMA201 Semester : II

Major - 5 Title: **REAL ANALYSIS - II**

Credits: 5 Max. Marks. 75

UNIT - I: FOURIER SERIES AND FOURIER INTEGRALS

Introduction - Orthogonal system of functions - The theorem on best approximation - The Fourier series of a function relative to an orthonormal system - Properties of Fourier Coefficients - The Riesz-Fischer Thorem - The convergence and representation problems for trigonometric series - The Riemann Lebesgue Lemma - The Dirichlet Integrals - An integral representation for the partial sums of Fourier series - Riemann's localization theorem - Sufficient conditions for convergence of a Fourier series at a particular point - Cesarosummability of Fourier series- Consequences of Fejer's theorem - The Weierstrass approximation theorem
Chapter 11 : Sections 11.1 to 11.15 (Apostol)

UNIT - II: MULTIVARIABLE DIFFERENTIAL CALCULUS

Introduction - The Directional derivative - Directional derivative and continuity - The total derivative - The total derivative expressed in terms of partial derivatives - An application to Complex-valued Functions - The matrix of linear function - The Jacobian matrix - The chain rule - Matrix form of chain rule - 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.
Chapter 12 : Section 12.1 to 12.14 (Apostol)

UNIT - III: IMPLICIT FUNCTIONS AND EXTREMUM PROBLEMS

Introduction - Functions with non-zero Jacobian determinants - The inverse function theorem -The Implicit function theorem -Extrema of real valued functions of one variable - Extrema of real valued functions of severable variables - Extremum problems with side conditions.
Chapter 13 : Sections 13.1 to 13.7 (Apostol)

UNIT - IV THE LEBESGUE INTEGRAL

Length of open sets and closed sets - Inner and outer measure: Measurable sets - Properties of measurable sets - Measurable functions - Definition and existence of the Lebesgue integral for bounded function.
Chapter 11 : Section 11.1 to 11.5 [R. R. Goldberg]

UNIT - V THE LEBESGUE INTEGRAL (Contd . . .)

Properties of the Lebesgue integral for bounded measurable functions - The Lebesque integral for unbounded functions - Some fundamental theorems - The metric space $L^2[a, b]$ - The integral on $(-\infty, \infty)$ and in the Plane.
Chapter 11 : Section 11.6 to 11.10 [R. R. Goldberg]

Recommended Texts:

1. Tom M. Apostol :Mathematical Analysis, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974. (for Units I, II and III)

2. Richard R. Goldberg, Methods f Real Analysis, Oxford & IBH Publishing, New Delhi, 1975. (for Unit IV and V)

Reference Books:

1. Burkill,J.C.The Lebesgue Integral, Cambridge University Press, 1951.

2. Munroe,M.E.Measure and Integration. Addison-Wesley, Mass.1971.

3. Roydon,H.L.Real Analysis, Macmillan Pub. Company, New York, 1988.

4. Rudin, W. Principles of Mathematical Analysis, McGraw Hill Company, New York,1979.

5. Malik,S.C. and Savita Arora. Mathematical Analysis, Wiley Eastern Limited. New Delhi, 1991.

6. Sanjay Arora and Bansi Lal, Introduction to Real Analysis, Satya Prakashan, New Delhi, 1991

C. Abdul Hakeem College (Autonomous), Melvisharam.

Syllabus for M.Sc., Mathematics effective from the year 2018-2019

Year: I Year Subject Code : P18MMA202 Semester : II

Major - 6 Title: **PARTIAL DIFFERENTIAL EQUATIONS**

Credits: 4 Max. Marks. 75

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–Cauchy's method of Characteristics - Compatible system - Charpits method.
Chapter 0: 0.4 to 0.11 (omit 0.1, 0.2, 0.3 and 0.11.1)

UNIT - II: FUNDAMENTALS

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

UNIT - III: ELLIPTIC DIFFERENTIAL EQUATIONS

Derivation of Laplace and Poisson equation - BVPs - Separation of Variables - Dirichlet's Problem and Neumann Problem for a rectangle –Interior Neumann Problem for a Circle - Solution of Laplace equation in Cylindrical and spherical coordinates - Examples.
Chapter 2: 2.1, 2.2, 2.5 to 2.7, 2.10 to 2.13 (omit 2.3, 2.4, 2.8 and 2.9)

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: 3.1 to 3.7 and 3.9 (omit 3.8)

UNIT - V: HYPERBOLIC DIFFERENTIAL EQUATIONS

Formation and solution of one-dimensional wave equation by canonical reduction – IVP; D'Alembert'ssolution - IVP and BVP for two-dimensional wave equation – Method of Eigenfunction- 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.
Chapter 4: 4.1 to 4.12 (omit 4.5, 4.6, 4.10& 4.13)

Recommended Text:

K. Sankar Rao, Introduction to Partial Differential Equations, 2nd Edition, Prentice Hall of India, New Delhi. 2007.

Reference Books:

1. R.C.McOwen, Partial Differential Equations, 2nd Edn. Pearson Eduction, New Delhi, 2005.
2. I.N.Sneddon, Elements of Partial Differential Equations, McGraw Hill, New Delhi,.
3. R. Dennemeyer, Introduction to Partial Differential Equations and Boundary Value Problems, McGraw Hill, New York, 1968.
4. M.D.Raisinghania, Advanced Differential Equations, S.Chand& Company L td., New Delhi, 2001.

C. Abdul Hakeem College (Autonomous), Melvisharam.

Syllabus for M.Sc., Mathematics effective from the year 2018-2019

Year:	I Year	Subject Code :	P18MMA203	Semester :	II
Major - 7	Title:	**CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS**			
Credits:	4			Max. Marks. 75	

UNIT-I: VARIATIONAL PROBLEMS WITH MOVING BUNDARIES

The concept of Variation and its properties - Euler's equation -Variational problems for functional - Functionals dependent on higher order derivatives - Functions of several independent variables - Some applications to problems of mechanics.
Chapter 1: 1.1 to 1.7

UNIT - II: VARIATIONAL PROBLEMS WITH MOVING BOUNDARIES

Movable boundary for a functional dependent on two functions - One sided variations - Reflection and Refraction of extremals - Diffraction of light rays.
Chapter 2: 2.1 to 2.5

UNIT – III: INTEGRAL EQUATIONS

Introduction - Definition - Regularity conditions - Special kinds of Kernals - Eigen values and eigen functions - Convolution integral - Reduction to a system of algebraic equations - Examples -Fredholm alternative - Examples - An approximation method.
Chapter 1: 1.1 to 1.5
Chapter 2: 2.1 to 2.5

UNIT – IV: METHOD OF SUCCESSIVE APPROXIMATIONS AND FREDHOLM THEORY

Method of successive approximations - Iterative scheme - Examples - Volterra integral equations - Examples - Some results about the resolvent kernel - The method of solution of Fredholm equation -Fredholm first theorem - Examples.
Chapter 3: 3.1 to 3.5
Chapter 4: 4.1 to 4.3

UNIT – V: APPLICATIONS TO ORDINARY DIFFERENTIAL EQUATIONS

Initial value problems - Boundary value problems - Examples - Singular integral equations - The Abel integral equations - Examples.
Chapter 5: 5.1 to 5.3
Chapter 8: 8.1 to 8.2

Recommended Text

1. A. S. Gupta, Calculus of Variations with Applications, PHI, New Delhi, 2005. (for Units I and II)

2. Ram P. Kanwal, Linear Integral Equations, Theory and Techniques, Academic Press, New York, 1971. (for Units III, IV and V)

Reference Books

1. M. D. Raisinghania, Integral Equations and Boundary Value Problems, S. Chand & Co., New Delhi, 2007.

2. Sudir K. Pundir and RimplePundir, Integral Equations and Boundary Value Problems, Pragati Prakasam, Meerut. 2005.

C. Abdul Hakeem College (Autonomous), Melvisharam.

Year: I Year Subject Code : P18MMA204 Semester : II

Major - 8 Title: **MATHEMATICAL PROGRAMMING**

Credits: 4 Max. Marks. 75

UNIT-I

INTEGER LINEAR PROGRAMMING : Types of Integer Programming Problems –Enumeration and cutting plane solution concept- Gomory's All Integer Cutting Plane Method - Gomory's mixed Integer Cutting Plane method - Branch and Bound Method.

DYNAMIC PROGRAMMING: Dynamic Programming Terminology - Developing Optimal Decision Policy - Dynamic Programming under Certainty - DP approach to solve LPP.

Chapter-7: 7.2 - 7.6 and Chapter-20: 20.2 - 20.5

UNIT-II

CLASSICAL OPTIMIZATION METHODS : Unconstrained Optimization - Constrained Multi-variable Optimization with Equality Constraints - Constrained Multi-variable Optimization with inequality Constraints.

NON-LINEAR PROGRAMMING METHODS: Introduction:- General NLPP - Graphical solution - Quadratic Programming - Wolfe's modified Simplex Methods.

Chapter-23: 23.2 - 23.4 and Chapter-24: 24.1 - 24.4 (Omit: 24.4.3, Beale's Method)

UNIT-III : THEORY OF SIMPLEX METHOD

Canonical and Standard form of LPP - Slack and Surplus Variables - Reduction of Feasible solution to a Basic Feasible solution - Alternative Optimal solution - Unbounded solution - Optimality conditions - Some complications and their resolutions.

Chapter-25: 25.2 - 25.4, 25.6-25.9

UNIT-IV

REVISED SIMPLEX METHOD : Standard forms for Revised simplex Method - Computational procedure for Standard form I - Comparison of simplex method and Revised simplex Method.

DUAL –SIMPLEX METHOD: Introduction –Dual -simplex algorithm.

Chapter-26: 26.2 - 26.4

Chapter-27: 27.1, 27.2 (omit Appendix 27.A)

UNIT-V

REPLACEMENT AND MAINTENANCE MODELS: Introduction - Typesof failure-Replacement of items whose Efficiency Deteriorates with Time-Replacement of Items that Fail completely

Chapter-17: 17.1 – 17.4.

Recommended Text:

J. K. Sharma, Operations Research, Theory and Applications, Third Edition (2007) Macmillan India Ltd.

Reference Books:

1. Hamdy A. Taha, Operations Research, (seventh edition) Prentice - Hall of India Private Limited, New Delhi, 1997.
2. F.S. Hillier &J.LiebermanIntroduction to Operation Research (7th Edition) Tata-McGraw Hill ompany, New Delhi, 2001.
3. Beightler. C, D.Phillips, B. Wilde ,Foundations of Optimization (2nd Edition) Prentice Hall Pvt Ltd., New York, 1979

4. S.S. Rao - Optimization Theory and Applications, Wiley Eastern Ltd. New Delhi. 1990.

Year: I Year Subject Code : P18EMA201 Semester : II

Elective - 2 Title: **DIFFERENCE EQUATIONS**

Credits: 3 Max. Marks. 75

UNIT-I: LINEAR DIFFERENCE EQUATIONS OF HIGHER ORDER

Difference Calculus - General Theory of Linear Difference Equations - Linear Homogeneous Equations with Constant coefficients - Linear non-homogeneous equations - Method of Undetermined coefficients, the method of variation of constants - Limiting behavior of solutions.

Chapter 2: Sections 2.1 to 2.5

UNIT-II: SYSTEM OF DIFFERENCE EQUATIONS

Autonomous System - The Basic Theory - The Jordan form - Linear periodic systems.

Chapter 3: Section 3.1 to 3.4

UNIT-III: THE Z-TRANSFORM METHOD

Definition, Example and properties of Z-transform - The Inverse Z-transform and solutions of Difference Equations: Power series method, partial fraction method, the inverse integral method - Volterra Difference Equations of convolution type - Volterra systems.

Chapter 5: Sections 5.1 to 5.3, 5.5 (omit 5.4)

UNIT-IV: ASYMPTOTIC BEHAVIOUR OF DIFFERENCE EQUATION

Tools and Approximation - Poincare's Theorem - Asymptotically diagonal systems - Higher order Difference Equations - Second order difference equations

Chapter 8: Sections 8.1 to 8.5

UNIT-V: OSCILLATION THEORY

Three-term difference Equations - Non-linear Difference Equations - Self-Adjoint second order equations.

Chapter 7: Sections 7.1 to 7.3

Recommended Text:

Saber N. Elaydi, An Introduction to Difference Equations, Springer Verlag, New York, 1996.

Reference Books:

1. R.P.Agarwal., Difference Equations and Inequalities, Marcel Dekker, 1999.

2. S. Goldberg, Introduction to Difference Equations, Dover Publications, 1986

3. V. Lakshmi kantham and Trigiante, Theory of Difference Equations, Academic Press, New York, 1988.

4. Peterson, A Difference Equations, An Introduction with Applications, Academic Press, New York, 1991.

Year: I Year Subject Code : Semester : II

Elective - 2 Title: ANALYTIC NUMBER THEORY

Credits: Max. Marks. 75

UNIT-I

Arithmetical function and Dirichlet multiplication.
Chapter 2

UNIT-II

Averages of Arithmetical function.
Chapter 3

UNIT-III

Congruence - Finite Abelian Groups and their characters
Chapter 5 (Omit 5.10 and 5.11) ; Chapter 6: 6.1 to 6.4

UNIT-IV

Finite Abelian Groups and their characters (contd. . .) - Dirichlet's theorem on Primes in Arithmetic Progressions
Chapter 6: 6.5 to 6.10; Chapter 7: All sections except 7.9

UNIT-V

Quadratic residues and quadratic reciprocity law.
Chapter 9 (Omit 9.10 and 9.11)

Recommended Text :

Tom Apostol, Introduction to Analytic Number theory, Narosa Publications, New Delhi,

Reference Books :

1. I. Niven and ZuckermannH.S. :An Introduction to the theory of numbers, Wiley Eastern Ltd. 1972

2. C.Y. Hsiung :Elementary Theory of Numbers, Allied Publishers.

3. W.W. Adams and L. J. Goldstein, Introduction to Number Theory, Prentice Hall Inc.

4. S.G. Telang, Number Theory.

C. Abdul Hakeem College (Autonomous), Melvisharam.

Year: I Year Subject Code : Semester : II

Elective -2 Title: ACTURIAL MATHEMATICS

Credits: Max. Marks. 75

UNIT - I AMORTIZATION AND SINKING FUNDS

Amortization of a Debt – Outstanding Principal – Mortgages – Refinancing a Loan - Sinking Funds.

Chapter 7. Sections 7.1 to 7.5 (omit 7.6)

UNIT - II BONDS

Introduction and Terminology – Purchase price to yield a given investment rate – Callable Bonds – Premium and Discount – Price of a Bond between Bond interest dates – Finding the yield rate.

Chapter 8. Sections 8.1 to 8.6 (omit 8.7)

UNIT - III CAPITAL BUDGETING AND DEPRECIATION

Net present value – Internal rate of return – Capitalized cost and Capital Budgeting.

Chapter 9. Sections 9.1 to 9.4

UNIT - IV CONTINGENT PAYMENTS

Introduction – Probability – Mathematical Expectation – Contingent payments with Time Value.

Chapter 10. Sections 10.1 to 10.4

UNIT - V LIFE ANNUITIES AND LIFE INSURANCE

Introduction – Mortality Tables – Pure Endowments – Life Annuities – Life Insurance – Annual Premium Policies.

Chapter 11. Sections 11.1 to 10.6

Recommended Text

Petr Zima and Robert L. Brown, Theory and Problems of Mathematics of Finance, Schaum's Outlines, Tata McGraw Hill, New Delhi, 2005.