



CHHINDWARA UNIVERSITY, CHHINDWARA

MADHYA PRADESH

Yearly Syllabus For Post Graduate

Subject – Mathematics (Final)



Meeting held on : 11-12 Feb 2020 – Session 2020-21 & Onwards

Class : M.Sc./M.A. (Final) (PRIVATE)

		Title of Paper		Paper	Max. Marks	Min. Pass. Marks
Compulsory Paper						
		Functional Analysis - I		First	50	20
		Functional Analysis - II		Second	50	20
Four papers out of the following have to be chosen, opting not more than one from each group.						
Group I	1	Partial Differential Equations - I		Third	50	20
		Partial Differential Equations - II		Fourth	50	20
	2	Operation Theory on Banach Algebra		Third	50	20
		Spline Theory		Fourth	50	20
Group II	1	Spherical Trigonometry & Astronomy - I		Fifth	50	20
		Spherical Trigonometry & Astronomy - II		Sixth	50	20
	2	Advanced Graph Theory - I		Fifth	50	20
		Advanced Graph Theory - II		Sixth	50	20
Group III	1	Mechanics - I		Seventh	50	20
		Mechanics - II		Eight	50	20
	2	Advanced Numerical Analysis - I		Seventh	50	20
		Advanced Numerical Analysis - II		Eight	50	20
Group IV	1	Operation Research - I		Ninth	50	20
		Operation Research - II		Tenth	50	20
	2	Integral Equation & Boundary Value Problems - I		Ninth	50	20
		Integral Equation & Boundary Value Problems - II		Tenth	50	20
Group V	1	Integral Transform - I		Eleventh	50	20
		Integral Transform - II		Twelfth	50	20
	2	Approximation Theory		Eleventh	50	20
		Approximation by Trigonometric & Algebraic Polynomials		Twelfth	50	20
Grand Total				500		

Board Of Studies :

II. Subject Expert -

3. Kamal

(Dr. Kamal Wadhwa)

I. Chairman - Dr. R.K. Sonwane

1. Dr. R.K. Sonwane

4. Dr. J.K. Agrawal

(Dr. J.K. Agrawal)

2. Dr. Rajesh Tiwari

5. Dr. A.C. Lamba



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The Scheme of examination and the allotment of marks shall be as under :-

Sections/Part	Questions Type	Marks Distribution	Remark
Section - A	Objective Type Questions (One question to be set from each unit)	1 x 5 = 5 Marks	
Section - B	Short Answer Type Questions (Two questions to be set from each unit and one from each unit to be attempted)	3 x 5 = 15 Marks	
Section - C	Long Answer Type Questions (Two questions to be set from each unit and one from each unit to be attempted)	6 x 5 = 30 Marks	
	Total	50 Marks	Passing Marks - 20

Note : Walk-out paper will not be held again.

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	First	
Title	:	Functional Analysis - I	
Compulsory/Optional	:	Compulsory	

Unit-I: Convergence, Completeness and Baire's Theorem, Cantors intersection Theorem, Continuous mappings, Uniformly continuous mapping, Spaces of continuous functions.

Unit-II: Euclidean and Unitary spaces, Cauchy, Minkowski and Holders inequalities, Normed linear spaces, Examples and elementary properties, Equivalence of norms, Banach space and examples, Continuous linear transformations.

Unit-III: Functionals and their extensions, related Lemma, Hahn-Banach Theorem for normed linear spaces, Conjugates of normed linear spaces, The natural embedding of normed linear space in its second conjugate space, Reflexive Banach spaces, open mapping theorem, Closed graph theorem.

Unit-IV: Conjugate of an operator, Uniform boundedness principle and its applications, Inner product spaces and their elementary properties, Parallelogram law, Schwartz inequality and polarization identity, Hilbert Space and examples, orthogonal complements in Hilbert spaces.

Unit-V: Orthonormal sets, Bessel's inequality, Gram Schmidt orthonormalization process, Conjugate Space of Hilbert Space, Riesz representation theorem, Adjoint of an operator, Properties.

Text Book:

G.F. Simmons, Topology and Modern Analysis, McGraw Hill International Edition, 1963.

Reference Books:

1. E. Kreyszig, Introductory Functional Analysis with Applications, John Wiley & Sons, New York, 1978.
2. R.E. Edwards, Functional Analysis, Dover Publ., New York, 1995. P.K. Jain, O.P. Ahuja and Khalil Ahmed, Functional Analysis, New Age International (P) Ltd. Publ.

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Second	
Title	:	Functional Analysis - II	
Compulsory/Optional	:	Compulsory	

Unit I

Hilbert spaces obtained from Hilbert spaces, Cartesian and Tensor product of Hilbert spaces, convex sets and projections. Projection on a cone and a linear subspace.

Unit II

Weak convergence, Weak compactness properties, Baire's Category Theorem, sequence of continuous linear functional, Banach Saks, Theorem, Weak semi continuity, Continuity of Projection on a closed convex set.

Unit III

Convex sets and convex programming elementary notions, internal, bounding and external points. Support functional of a Convex set, simple example, Minkowski functional support plane through a boundary point, support mapping, Separation theorem.

Unit-IV

Functions transformations and operators, Linear operators and their adjoints, bounded and unbounded operators projection operator and differential operator.

Unit-V

Spectral theory of operators, resolvent of operator, resolvent set and spectrum. Spectral radius, Compact operators, its characterizing property.

Text Books :

V. Balakrishnan : Applied Functional Analysis, Springer Verlag, New York.

Reference:

1. Ervin Kreyszig : introductory Functional Analysis with Applications, John Wiley and Sons.
2. B.V. Limaye : Functional Analysis II Edition, New Age International Publishers.

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Third	
Title	:	Partial Differential Equations - I	
Optional : Group/Paper	:	Optional : Gr-I / 1	

Unit-1

Transport Equation-Initial Value Problem, Non-homogeneous equations, Laplace's Equations - Fundamental Solution

Unit-2

Mean value Formula properties of Harmonic functions, Green's Functions, Energy Methods.

Unit-3

Heat Equation - Fundamental Solution,

Unit-4

Mean Value Formula for heat equations, Properties of Solutions, Energy Methods

Unit-5

Wave Equation - Solution by Spherical Means, Non – homogeneous Equations, Energy Methods.

Text Books :

L.C. Evans, Partial Differential Equations, 1998.


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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Fourth	
Title	:	Partial Differential Equations-II	
Optional : Group/Paper	:	Optional : Gr- I / 1	

Unit 1

Nonlinear First order PDE. Complete integrals, Envelopes, Characteristics.

Unit 2-

Hamilton Jacobi Equation, Calculus of Variations, Hamilton's ODE, Legendre Transform, Hopf-Lax formulae, weak solution, Uniqueness.

Unit 3

Conservation Laws (Shocks, Entropy Condition, Lax – Oleinik formula, Weak solutions, Uniqueness. Riemann's Problem, Long Time behavior) Representation of Solution - Separation of Variables, Similarity Solutions (Plane and Traveling Waves, Solitons, Similarity under Scaling).

Unit 4

Fourier and Laplace Transform, Hopf - Cole Transform, Hodograph and Legendre Transforms, Potential Functions, Asymptotics (Singular Perturbations, Laplace's Method, Geometric Optics)

Unit 5

Stationary Phase Homogenization, Power Series (Non-characteristic surface, Real Analytic functions, Cauchy - Kovalevskaya Theorem).

Text Books :

L.C. Evans, Partial Differential Equations, 1998.

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Third	
Title	:	Operator Theory on Banach Algebra	
Optional : Group/Paper	:	Optional : Gr- I / 2	

Unit I:

The Banach Algebra of Continuous functions, Abstract Banach Algebras, Abstract Index in a Banach Algebra, Gelfand and Mazur Theorem, Spectral radius formula.

Unit II:

Stone-Weierstrass theorem, The Disk algebra, Algebra of functions with absolutely convergent Fourier series.

Unit III:

Adjoint operator, Normal and self adjoint operators, Projections and subspaces, Multiplication operators.

Unit IV:

C^* algebras, Gelfand Naimark theorem, Spectral theorem, Functional calculus, square root of positive operators.

Unit V:

Weak and strong operator topology, W^* algebras, Isomorphism of L^∞ spaces, Maximal abelian W^* algebras.

Text Book

R. G. Douglas, Banach Algebra Techniques in Operator Theory, Academic Press, 1972.

Reference Book

1. R. Larsen, Banach algebras, Marcel Dekker Inc., New York, 1973.
2. B. V. Limaye, Functional Analysis, Wiley Eastern Limited, New Delhi, 1996

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Fourth	
Title	:	Spline Theory	
Optional : Group/Paper	:	Optional : Gr- I / 2	

Unit I

Polynomial Interpolation: Lagrange form, divided difference and Newton form, K-th divided difference, Osculatory interpolation, Limitation of polynomial approximation, Runge example.

Unit II

Piecewise linear approximation: Broken line interpolation is nearly optimal, Least-squares approximation by broken lines, Good meshes, square root example.

Unit III

Piecewise cubic interpolation: Cubic Hermite interpolation, Cubic Bessel interpolation, Akima interpolation, Cubic spline interpolation, Boundary conditions, Best approximation properties of complete cubic spline and its error, Truncated power function, Pythagoras theorem, smoothest interpolation property, Best approximation property.

Unit IV

Parabolic spline interpolation: Difference of two parabolic splines, interpolation of data values given at mid points of mesh intervals, Existence and uniqueness of parabolic splines, Piecewise polynomial representation for p^{\wedge} .

Unit V

The space $P^{\wedge v}$ and truncated power basis: The smoothing of a histogram by parabolic splines, truncated power basis, truncated power function, representation of a function of $P_k^{\wedge v}$, There presentation of pp function by B-splines, The support of B-splines, Partition of unity by B-splines, Spline function as a combination of B-splines.

Text Book:

1. C. De Boor, A Practical Guide to Splines, Springer-Verlag, New York, 1978.

Reference Books:

1. L.L. Shumaker, Spline Functions Basic Theory, John Wiley & Sons, New York, 1981.
2. P.J. Davis, Interpolation and Approximation, Dover Publications, INC, New York, 1975.

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Fifth	
Title	:	Spherical Trigonometry and Astronomy - I	
Optional : Group/Paper	:	Optional : Gr-II / 1	

Unit-I:

Fundamental of Spherical Trigonometry

Unit-II:

Relation between sides & angles of a Spherical triangle.

Unit-III:

Properties of Right angle spherical triangle

Unit-IV:

Solution of right angled spherical triangle.

Unit-V:

Application of Spherical triangle & Examples.

(Chapters as per Text Book)

TEXT BOOKS:-

A text book of spherical Astronomy : Gorakh Prasad.

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Sixth	
Title	:	Spherical Trigonometry and Astronomy - II	
Optional : Group/Paper	:	Optional : Gr - II / I	

Unit -I

Spherical Astronomy-Celestial sphere. Various system of references and related topics.

Unit -II

Rising and setting of stars, rate of zenith distance and azimuth. Twilight.

Unit-III

Transit instrument.(Astronomical instruments), Atmospheric Refraction.

Unit IV

Time, planetary phenomena.

Unit-V

Kepler's law of planetary motions, Aberration

(Chapters as per Text Book)

TEXT BOOKS:-

A text book of spherical Astronomy : Gorakh Prasad.

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Fifth	
Title	:	Advanced Graph Theory-I	
Optional : Group/Paper	:	Optional : Gr-II / 2	

Unit-I:

Revision of graph theoretic preliminaries, Operations on graphs. Graph Isomorphism Disconnected graph and their Components. Traveling salesman problem, round table problem.

Unit-II:

Eulerian and Hamiltonian Paths and circuits.

Unit-III:

Properties of trees, Distance centre, radius, diameter eccentricity and related theorems, Graph as Metric space Rooted and binary trees.

Unit-IV:

Labelled graph and trees spanning tree, weighted spanning tree, Shortest path.

Unit-V:

Fundamental cut sets. Rank and nullity, cut sets and cut vertices, fundamental cut sets.

Text Book:

Graph Theory with Application to Engineering and Computer Science
By Narsingh Deo.

Reference Books:

Graph Theory by Harary.

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Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Sixth	
Title	:	Advanced Graph Theory-II	
Optional : Group/Paper	:	Optional : Gr-II / 2	

Unit-I:

Connectivity and separability in graphs Abstract graphs geometric graphs planar graphs Kurtowski two graphs embedding and regions of a planar graphs Detection of planarity.

Unit-II:

Geometric dual and combination dual.

Unit-III:

Coloring and covering of graphs, Chromatic, Polynomial chromatic partitioning Dimmer problem Domination sets independent sets, Four colour conjecture.

Unit-IV:

Digraph and types of digraphs, Digraph and binary relation Equivalence relation in a graph Directed path walk circuit and connectedness Eulerian digraph, arborescence matrices A, B and C of digraphs.

Unit-V:

Adjacency metric of a digraph, Algorithms, Kruskal algorithm, Prism algorithm, Dijkstra Algorithm.

Text Book:

Graph Theory with Application to Engineering and Computer Science
By Narsingh Deo.

Reference Books:

Graph Theory by Harary.

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Seventh	
Title	:	Mechanics - I	
Optional : Group/Paper	:	Optional : Gr-III / 1	

Unit-I:

Constraint and its classification, Possible and virtual displacements Generalized Coordinates. Holonomic and Non- Holonomic systems.

Unit-II:

Scleronomic and Rheonomic system, generalized potential. Lagrange's equation of first kind.

Unit-III:

Lagrange's equation of second Kind. Uniqueness of solution. Energy equation for conservation fields.

Unit-IV:

Hamilton's variables. Donkin's theorem. Hamilton's canonical equations. Cyclic coordinates, Routh's equation, Poisson's bracket, Poisson's Identity. Jacobi- Poisson theorem. Motivating problem Problems of calculus of variations

Unit-V:

Shortest distance. Minimum surface of revolution. Brachistochrone problem. Isoperimetric problem, problems of Geodesic.

Text Books:

1. F. Gantmacher, Lectures in Analytic Mechanics MIR Publishers.
2. H. Goldstein Classical Mechanics (2nd Edition), Narosa Publishing House, New Delhi.
3. J.C. Upadhyaya – Classical Mechanics. (Himalaya Publication House)

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Eight	
Title	:	Mechanics - II	
Optional : Group/Paper	:	Optional : Gr - III / I	

Unit – I

Fundamental lemma of calculus of variations Euler's equation for one dependent function and its generalization to (i) n dependent function (ii) higher order derivatives. Conditional extremum. Lagranges equations of second kind independent coordinates. The equation of motion in a potential field. Canonical equations of Hemilton.

Unit-II

Conditional extremum under geometric constraints and under integral constraints. Hamilton's Principle of least action Poincare CartenIntegral invariant Whittaker equation Jacobi's equations. Statement of lee HWA Chung's theorem.

Unit-III

Hamilton – Jacobi equation. Jacobi theorem. Method of separation of variables. Lagrange Brackets.

Unit-IV

Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets Invariance of Lagrange brackets and Poisson brackets under canonical transformation.

Unit-V

Distribution for a given potential. Equipotent surfaces. Surface and solid harmonic. Surface density in terms of surface harmonics. Potential of a finite rod. Potential of a circular disc. Poission theorem Cartesian and polar form. Laplace theorem for Cartesian and polar form.

Text Books:

1. F. Gantmacher, Lectures in Analytic Mechanics MIR Publishers.
2. H. Goldstein Classical Mechanics (2nd Edition), Narosa Publishing House, New Delhi.
3. J.C. Upadhyaya – Classical Mechanics. (Himalaya Publication House)

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Seventh	
Title	:	Advanced Numerical Analysis - I	
Optional : Group/Paper	:	Optional : Gr-III / 2	

Unit-I:

Piece wise and spline interpolation: Piecewise Linear Interpolation, Piecewise Quadratic Interpolation, Piecewise cubic Interpolation, Piecewise cubic Interpolation using Hermite type data, Quadratic and cubic spline Interpolation, Bivariate interpolation.

Unit-II:

Approximation : Least squares Approximation, Gram-schmitt orthogonalization process, chebyshev polynomials, legendre polynomials.

Unit-III:

Uniform approximation : Uniform norm, uniform polynomial approximation, best Approximation, best Uniform approximation condition for uniform best approximation.

Unit-IV:

Rational approximation, choice of method, Runge's example.

Unit-V:

Numerical differentiation: Methods based on interpolation Method, Methods based on finite difference operators, methods based on undetermined coefficients, optimum choice of step length.

Text Book:

Numerical Method for scientific and Engineering computation by M.K. Jain, S.R.K. Iyenger, R.K. Jain south Edition (2003) New Age.

Reference Books :

1. Finite Differences and numerical analysis, H.C. Saxena – S Chand Publication.
- Atkinson, K. Elementary Numerical Analysis, Wiley New York, 1985

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Eight	
Title	:	Advanced Numerical Analysis - II	
Optional : Group/Paper	:	Optional : Gr-III / 2	

Unit-I:

Extrapolation Methods for Numerical Differentiation. Multistep methods for Numerical Solution of initial value problems. Explicit and implicit Multi step methods

Unit-II:

General Multistep methods : $\rho(\xi)$ and $\sigma(\xi)$ for linear multiple step methods . Convergence of Multi step methods. Predictor corrector methods.

Unit-III:

Stability analysis of Multistep methods: First order differential Equations. Stability of Predictor- Corrector Methods. Stability of PMp CMc methods , second Ordinary Differential.

Unit-IV:

Ordinary differential Equations: Three kind of Boundary conditions . Finite Difference methods, Linear second order differential Equations, Non linear second order differential Equations.

Unit-V:

Finite element method : Finite element Ritz Finite element method methods, Linear Boundary Value Problems, mixed boundary conditions.

Text Book:

Numerical Method for scientific and Engineering computation by M.K. Jain, S.R.K. Iyenger, R.K. Jain south Edition (2003) New Age.

Reference Books :

1. Finite Differences and numerical analysis, H.C. Saxena – S Chand Publication.
- Atkinson, K. Elementary Numerical Analysis, Wiley New York, 1985

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Ninth	
Title	:	Operations Research -I	
Optional :Group/Paper	:	Optional : Gr - IV / 1	

Unit-1

Operations Research and its scope, Origin and Development of Operations Research, Characteristics of Operations Research.

Unit-2

Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.

Unit-3

Graphical procedure, Graphical solution of property behaved L.P problems. Graphical solution in some exceptional cases.

Unit-4

General Linear Programming Problem : Simplex Method exceptional cases, artificial variable techniques ; Big M method, two phase Method and problem of degeneracy.

Unit-5

Concept of Duality : Definition of Primal-dual problems ,Symmetric Primal-dual problems, Unsymmetric Primal-dual problems, General rules for converting any primal into its dual. Fundamental theorem of duality.

Text Book:

Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi

Reference Books :

- 1-S.D, Sharma, Operation Research,
- 2-F.S, Hiller and G.J. Lieberman, Industrial Engineering Series, 1995
- 3-G. Hadley , Linear Programming, Narosa Publishing House. 1995.
- 4-G. Hadley, Linear and Dynamic programming, Addison - Wesley Reading Mass.
- 5-H.A. Taha, Operations Research - An introduction, Macmillan Publishing co. Inc. New york.
- 6-Prem Kumar Gupta and D.S. Hira, Operation Reasearch, an Introduction, S. Chand & Company Ltd. New Delhi.
- 7-N.S. Kambo, Mathematical Programming Techniques, Affiliated East - West Pvt. Lt

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Tenth	
Title	:	Operations Research -II	
Optional : Group/Paper	:	Optional : Gr- IV / 1	

Unit-I

Replacement Problems : Replacement of Items that deteriorate , Replacement policy for items whose maintenance cost increase with time and money value is constant. Money value , present worth factor (PWF) and discount rate . Replacement policy for items whose maintenance cost increase with time and money value with constant rate. Individual Replacement policy, Mortality theorem, Group replacement policy.

Unit-II

Assignment problems : Mathematical formulation, Fundamental theorems. Hungarian method for assignment problem. Unbalanced assignment problem . The Travelling Salesman (Routing) problem, Job sequencing Processing n Jobs through 2 machines , Processing n Jobs through 3 machines, a graphical method.

Unit-III

Transportation problems : North - West Corner Method Least – Cost Method. Vogel's Approximation Method, MODI Method, Exceptional cases and problem of degeneracy.

Unit-IV

Network analysis, constraints in Network, Construction of network, Critical Path Method (CPM) PERT, PERT Calculation, Resource Leveling by Network Techniques and advances of network (PERT/CPM)

Unit-V

Game theory - Two persons, Zero - Sum Games, Maximix – Minimax principle, games without saddle points -Mixed strategies, Graphical solution of $2 \times m$ and $m \times 2$ games, Solution by Linear Programming, Non- Linear programming Techniques - Kuhn - Tucker Conditions, Non - negative Constraints.

Text Book:

- 1 S.D. Sharma, Operation Research,
- 2 Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.
- 3 F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 (This book comes with a CD containing software
- 4 G. Hadley , Linear Programming, Narosa Publishing House. 1995.
- 5 G. Hadley, Linear and Dynamic programming, Addison - Wesley Reading Mass.
- 6 H.A. Taha, Operations Research - An introduction, Macmillan Publishing co. Inc. New york.

Reference Books :

- 1 Prem Kumar Gupta and D.S. Hira, Operation Research, an Introduction, S. Chand & Company Ltd. New Delhi
- 2 N.S. Kambo, Mathematical Programming Techniques, Affiliated East - West Pvt. Ltd. New Delhi. Madras

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Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Ninth	
Title	:	Integral Equations & boundary value problems - I	
Optional : Group/Paper	:	Optional : Gr- IV / 2	

Unit - I

Initial value problem for ODEs Methods of existence and uniqueness of the solution of the ordinary differential equation of the first order and their examples.

Unit - II

Two point Boundary Value Problems, Sturm Liouville BVP, Non homogeneous BVP, Singular Sturm Liouville BVP.

Unit- III

Classification of Linear integral Equations. Solution of an integral equation, Converting Volterra Integral equation to an ODE. Converting IVP to Volterra Integral Equations.

Unit - IV

Classification of non linear integral equations, Singular Integral equations, Abel's problem, The generalized Abel's Integral Equation.

Unit - V

Fredholm Integral equations, The Adomian Decomposition Method, The Variational Iteration method, The direct computation method, The successive approximations method.

Text Book:

1. A-M Wazwaz, A first course in Integral Equations, World Scientific Singapore.
2. S.G. Mikhlin: Integral equations, (Vol 4) (Translation), Pergamon Press, London.
3. L. G. chambers, Integral equations- A short course International Suggested Books company East Kilbride, Scotland.

Reference Books :

1. V. I. Smirnov A course of higher Mathematics, Vol.IV, (Translation); Pergamon Press, Oxford
2. C.Corduneanu, Integral equations & Applications, Cambridge University Press, Cambridge.
3. BP Parashar, Differential & Integral Equations, CBS Publishers & Distribution, Delhi.

Board Of Studies :

II. Subject Expert -

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I. Chairman -

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CHHINDWARA UNIVERSITY, CHHINDWARA

MADHYA PRADESH

Yearly Syllabus For Post Graduate

Subject – Mathematics (Final)



Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Tenth	
Title	:	Integral Equations & boundary value problems - II	
Optional : Group/Paper	:	Optional : Gr- IV / 2	

Unit – I

Eigen values and Eigen functions. Fredholm Integral equations of second kind with Saperable Kernels. Iterared kernels, Resolvent kernels.

Unit– II

Volterra integral equation of the second kind, Fredholm alternative theorem. Fredholm integral equation of first kind. Volterra integral equation of first kind.

Unit– III

Gauss differential equations, Legendre differential equations, Bessel's differential equations

Unit– IV

Hilbert-Schmidt theory, Orthogonality and orthonormality of Eigen-functions. Bessel's inequality, Hilbert Schmidt's expansion theorem.

Unit– V

Green's function, properties of Green's function and its construction. Application of Green's function to Solving BVP involving ODE.

Text Book:

1. Lectures on Differential & Integral equations; Vol X, Kosaku Yosida, Innterscience Publishers London 1960.
2. Integral Equations and Boundary Value Problems:, M.D. Raisinghanian, S.Chand Publications, New Delhi

Reference Books :

1. Integral equations; (Vol 4) (Translation), S.G. Mikhlin, Pergamon Press London.
2. Integral equations- Ashort course, L. G. chambers International Suggested Books Compan East kilbridge, Scotland.
3. A course of higher Mathematics, Vol.IV, (Translation); V. i. Smirnov, Pergmon Press, Oxford,(chapter I: . Integral equations, chapter IV: Boundary value Problems)
4. Integral equations & Applications, C. Corduneanu, Cambridge University Press, Cambridge.
5. Differential & Integral Equations; BP Parashar, CBS Publishers & Distribution, Sahdara, Delhi.

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CHHINDWARA UNIVERSITY, CHHINDWARA

MADHYA PRADESH

Yearly Syllabus For Post Graduate

Subject – Mathematics (Final)



Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Eleventh	
Title	:	Integral Transforms - I	
Optional : Group/Paper	:	Optional : Gr-V / 1	

Unit-I:

Problem related to Laplace transform Initial and bounding value problems, simultaneous ordinary differential equations. Problem related to solution of partial differential equations. Application of Laplace Transformed in Differential Equations .

Unit-II:

Two dimensional Laplace's Equation (Cartesian and Polar form). Three dimensional Laplace's Equation to related problems

Unit-III:

Notion of wave Equation. General solution of wave Equations. Solution by separation of variables. Solution of two dimensional wave equation , three dimensional wave equation.

Unit-IV:

Definition: Integral Equations, problems related to Integral Equations of convolution type. Integral differential equation . Abel's differential equation.

Unit-V:

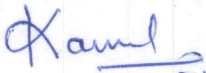
Notion of Heat Equations. One and two dimensional heat conduction equation. Solution by separation of variables and problems based on it.

Texts Books :-

1. Integral Transforms by Goyal & Gupta.
2. Integral Transforms by Sneddon.

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MADHYA PRADESH

Yearly Syllabus For Post Graduate

Subject – Mathematics (Final)



Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Twelfth	
Title	:	Integral Transforms - II	
Optional : Group/Paper	:	Optional : Gr-V / 1	

Unit - I

Application of Laplace Transform to boundary value problems.

Unit - II

Electric Circuits problems, related to application of Electric Circuits. Application to dynamics, application to heat conduction equation, application to wave equations. Application to Beams.

Unit -III

The complex Fourier Transform, Inversion Formula, Fourier cosine and sine transform.

Unit-IV

Properties of Fourier Transforms, Convolution & Parseval's identity.

Unit-V

Fourier Transform of the derivatives, Finite Fourier Sine & Cosine Transform, Inversion Operational and combined properties Fourier transform.

Texts Books :-

1. Integral Transforms by Goyal & Gupta.
2. Integral Transforms by Sneddon.

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Yearly Syllabus For Post Graduate

Subject – Mathematics (Final)



Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Eleventh	
Title	:	Approximation Theory	
Optional : Group/Paper	:	Optional : Gr- V / 2	

Unit-1

Linear Operators, Examples- Bernstein Polynomials, Fourier series.

Unit-2

Approximation theorems, Bohman and Korovkin's theorems and its applications, Theorem of Stone.

Unit-3

Existence of polynomials of best approximation, characteristics of polynomials of best Approximation.

Unit-4

Applications of convexity, chebyshev system, Uniqueness of polynomial of Best Approximation.

Unit-5

Chebyshev theorem, Chebyshev polynomial, Interpolation, Algebraic polynomials, Trigonometric polynomials.

Text Books:

1. G.G. Lorentz, Approximation of Functions; Holt Rinehart and Winston, Inc. 1966.

Reference Books:

1. Hrushikesh N., Mahaskar and D.V. Pai. Fundamentals of Approximation theory, Narosa Publishing House, 2000.
2. Timan A.F., Theory of Functions of Real Variable, New York, Macmillan, 1963.
3. G. Meinardus, Approximation of Functions Theory and Numerical Methods.

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Yearly Syllabus For Post Graduate

Subject – Mathematics (Final)



Class	:	M.Sc./M.A. (Final)	Max. Marks - 50
Subject	:	Mathematics	Min. Pass. Marks - 20
Paper	:	Twelfth	
Title	:	Approximation by Trigonometric and Algebraic Polynomials	
Optional : Group/Paper	:	Optional : Gr- V / 2	

Unit I

Fourier Series, Preliminaries, convergence of Fourier series, summability convergence of trigonometric series.

Unit II

The degree of approximation by trigonometric polynomial Generalities. Theorem of Jackson, The degree of approximation of differentiable functions, Inverse theorems, Differential functions.

Unit III

The degree of approximation by Algebraic polynomials, Preliminaries, The approximation theorems, Inequalities for the derivatives of polynomials, Inverse theorems.

Unit IV

Approximation by linear polynomials operators, sums of de la Vallee Pousson-positive operators, The principle of uniform boundedness, operators that preserve trigonometric polynomials, Trigonometric saturation classes.

Unit V

Least First Power of Approximation, Approximation on an Interval, Some computational aspects.

Text Books:

1. Hrushikesh N Mhaskar and D.V. Pai; Fundamentals of Approximation Theory, Narosa Publishing House, 2000.
2. G.G., Lorentz, Approximation of Functions, Holt, Rinehart and Wiston, Inc. 1966.
3. T.J. Rivlin, An Introduction to the Approximation of Functions.

Reference Books :

1. Timan, A.F., Theory of Functions of Real Variable, New York, Mackmillan, 1963.
2. G. Meinnardus, Approximation of Functions, Theory and Numerical Methods, Springer Verlag Vol-13, 1967.

Board Of Studies :

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