



MADHYANCHAL

PROFESSIONAL UNIVERSITY

SCHEME FOR M.Phil

SEMESTER -1

Subject Name-Mathematics

S.NO	NAME OF THE PAPER	PAPER CODE	THEORY		TOTAL MARKS	HOURS PER WEEK		TOTAL CREDIT
			END SEM	INTERNAL		L	T	
1	Research methodology	MPMETH101	60	40	100	3	1	4
2	Advanced Numerical Analysis	MPMETH102	60	40	100	3	1	4
3	Analysis & Differential Equations	MPMETH103	60	40	100	3	1	4
4	Advanced Operations Research	MPMETH104	60	40	100	3	1	4
5	Literature review	MPMETH105	60	40	100	3	1	4
	TOTAL MARKS		300	200	500			

INTERNAL- ARTICLE/PAPER/ CLASS ROOM TEACHING/FIELD VISIT SEMINAR/CONFERENCE

SCHEME FOR M.Phil

SEMESTER -2

Subject Name-Mathematics

S.NO	NAME OF THE PAPER	PAPER CODE	THEORY		TOTAL MARKS	HOURS PER WEEK		TOTAL CREDIT
			END SEM	INTERNAL		L	T	
1	Real and complex analysis	MPMETH201	60	40	100	3	1	4
2	Measure and integration	MPMETH202	60	40	100	3	1	4
3	Fuzzy set Theory and Fuzzy Logic	MPMETH203	60	40	100	3	1	4
4	Real and Functional Analysis	MPMETH204	60	40	100	3	1	4
5	Dissertation	MPMETH205	60	40	100	3	1	4
	TOTAL MARKS		300	200	500			

INTERNAL- ARTICLE/PAPER/ CLASS ROOM TEACHING/FIELD VISIT SEMINAR/CONFERENCE

SEM.-1**Paper -1****Research methodology****PAPER CODE-MPMETH101****Unit – 1****Introduction to Research**

Meaning, Types, Process, Importance of research, Meaning of Research Problems, Sources of research problem, selection & formulation of research problems, Research application in decision making.

Unit – 2**Review, Report writing & hypothesis formulation**

An Introduction to literature review and referencing, formulation of research hypothesis, meaning of research design, features of good research design, types of research design. Types of research report, styles of reporting, steps in drafting research report, writing of research proposal, bibliography

Unit – 3**Quantitative Methods for problem solving**

An introduction to statistical modeling and analysis, spectral analysis and its applications, Multivariate method of correlation & regression, ANOVA, Sampling & Test of significance. Tables and graphs of frequency, data of one variable and two variable, Relation between frequency distributions and other graphs, Preparing data for analysis.

Unit – 4**Computer Skill**

Brief history of computers, generation of computers, application of computers in research. Introduction of hardware & software of computers, operating systems and types of operating systems. – Data processing tools & techniques, Security issue of computers, use of later.

Unit – 5**Report Writing**

Use of MATLAB analysis, SPSS, GRETL in research .Introduction to evolutionary algorithms, fundamental of genetic algorithm, simulated annealing, neural network based optimization, optimization of fuzzy system. Use of excel for simple statistical calculations of central tendency, S.D. correlation, Regression, Preparation of graphics & diagrams, Factors analysis.

Reference books.

- Research methodology by Dr. C.R. Kothari
- Statistical methods by S.P. Gupta.
- Research Methodology by Deepak Chawala

- Basic Computer Engineering By Amit Kumar Mishr

SEM.-1

Paper -2

PAPER CODE-MPMETH102

Advanced Numerical Analysis

UNIT-I

Error in Numerical Calculations: Numbers and their accuracy, errors and their Analysis, General error formula, Error in a series Approximation.

UNIT-II

Two Point boundary value Problems: Linear ordinary differential equations, Non Linear ordinary differential equations, Non-uniform grid methods for the Seconds order Boundary value problems.

UNIT-III

Numeric Solution of Integral Equations: Integral equation, Finite difference methods, methods of degenerate Kernets, Method of Invariant Impeding, Method using Generalized Quadrature, Evaluation of singular integrals.

UNIT-IV

Numerical Solution of Partial Differential Equations : Finite difference Approximations to Derivatives, laplace's Equations jacobi's method, Gaussiedel and successive over Relaxation methods, Parbolic and Hyperbolic equations Iterative method and choice of initial approximation.

UNIT-V

Finite Element Methods: Introduction, residual Methods, Verification methods, Elements, Assembly of elements equadic application value problems and initial value problems such as flow or local fluids, Flow of Viscous fluids, Transient heat condition.

REFERENCES:

1. Mumerical Methods for Scientific and Engineering computation: Jain lynger.
2. Numerical Analysis : Sastri, S.S.

SEM.-1**Paper -3****PAPER CODE-MPMETH103****Analysis & Differential Equations****UNIT-I****LEBESGUE MEASURE:**

Introduction: - Outer measure - sets & Lebesgue measure - A non measurable set - Measurable functions-Littlewood's three principals.

UNIT-II**THE LEBESGUE INTEGRAL:**

Riemann integral - The Lebesgue integral of bounded function over a set of finite measure- The integral of a non-negative function-The general Lebesgue integral-Convergence in measure.

UNIT-III**DIFFERENTIATION & INTEGRATION:**

Differentiation of monotone functions- Functions of bounded variation - Differentiation of an integrate Absolute continuity-Convex functions. (Section 5-5.1 to 5.5)

UNIT-IV

Introduction equations with constant coefficient : Introduction-The 2nd order homogeneous equation- Initial value problem for second order equations - Linear dependence - A formula for the Wronskian- The non-homogeneous equation of order two - The homogeneous equation of order 'n' - Initial value problem for nth order equations-Equations with real constant. (Section 2-2.1 to 2.9 omit 2.10 to 2.11, 2.12)

UNIT-V

Introduction-Initial value problem for the homogeneous equation-Solutions of the homogeneous equation-the Wronskian and linear independence-Reduction of order of a homogeneous equation - The non-homogeneous equation.

REFERENCES:

1. Real analysis by H.L. Royden. 3rd editing- Prentice Hall and Publication

SEM.-1**Paper -4****PAPER CODE-MPMETH104****Advanced Operations Research****UNIT-I**

Inventory control: Deterministic and probabilistic model, price break inventory, Replacement, Renewal theory, maintenance and Reliability.

UNIT-II

Transportation Problem: A streamlined simplex method for the transportation, Problem, Stepping stone method, Transshipment problem. Assignment Problem: Traveling sales person problem.

UNIT-III

Queuing Theory: The Birth and Death process, queuing models involving non-exponential distributions, Priority-discipline queuing model, and Queuing networks.

UNIT-IV

Project Management: Networks, shortest Route problem, Minimal spanning tree Problem, Maximum flow problem, project planning and control with PERTCPM.

UNIT-V

Simulation: Phases of Simulation model, Monte Carlo Simulations.

REFERENCES:

1. Operations Research : Hiller & Liberman
2. Numerical Analysis : Within and Heddley
3. Elements of Queuing theory with application : Satty
4. Linear Programming and Network flow : M.S. Bazaraa, J.J.Jarvis and H.D. Sherali
5. System Simulation : G. Gordon
6. Optimization Moderation Modeling with LINDO : Linus Scharge

Paper -5
Subject code-MPMETH105
Literature review

A **literature review** or **narrative review** is a type of review article. A literature review is a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Literature reviews are secondary sources, and do not report new or original experimental work. Most often associated with academic-oriented literature, such reviews are found in academic journals, and are not to be confused with book reviews that may also appear in the same publication. Literature reviews are a basis for research in nearly every academic field. A narrow-scope literature review may be included as part of a peer-reviewed journal article presenting new research, serving to situate the current study within the body of the relevant literature and to provide context for the reader. In such a case, the review usually precedes the methodology and results sections of the work.

SEM.-2

Paper -1

PAPER CODE-MPMETH201

REAL AND COMPLEX ANALYSIS

UNIT-I

POSITIVE BOREL MEASURES :

Vector Space-Topological Preliminaries-The Riesz representation theorem-Regularity properties of Borel measures. L^p SPACES : Convex function and inequalities-The L^p Spaces-Approximation by continuous functions.

UNIT-II

ELEMENTARY HILBERT SPACE THEORY :

Inner product and linear functionals-Orthonormal sets-Trigonometric series.EXAMPLES OF BANACH SPACE TECHNIQUES :Banach space-Consequence of Baire's Theorem-Fourier series of continuous functions-Fourier coefficient of L^1 Functions-The Hahn-Banach Theorem.

UNIT-III

COMPLEX MEASURES :

Total variation-Absolute Continuity-Consequence of Randon-Nikodym heorem-bounded Linear Functional L^p the Riesz representation theorem.

UNIT-VI

INTEGRATION ON PRODUCT SPACE:

Measurability on Cartesian Products-Product measures-The Fubini heorem-Completion of Product Measure-Convolutions.

UNIT-V

FOURIER TRANSFORMS :

Formal Properties-The Inversion theorem-the Plancherel Theorem-the Banach Algebra L^1 .

REFERENCES:

1. "Real & Complex Analysis" by walter rudin II Edition - Tata McGraw Hill Publishing Co. Limited, New Delhi.

SEM.-2
Paper -2
PAPER CODE-MPMETH202
Measure and integration

UNIT-I

Measurable spaces: Ring, Alzebras, Monotone classes, measurable space.

UNIT-II

Measurable functions: Labesgu Measurable functions, Alzebras of measurable functions, Sequences of measurable function convergence in measure, Riese's Theorem simple Functions, Luzin's Theorem.

UNIT-III

Outer measures: Outer measure (CARA THEODORY), Measurable sets, Algebra of measurable sets, Measures of Locally compact Hausdroff space.

UNIT-IV

Integration and Summable Function : Measurable dissection of set Lebegue Integral Passage of limit under the sign of integral, Lagesgue, Dominated Comvergence theorem, Riez's Representation, Theorem, Regular measures. Lp-spaces, Lpspaces, Holder's inequality, Minkowshi's inequality, Completeness of Lp spaces.

UNIT-V

Product measures, Product measurable space section, Fubini's theorem, Integration of Vector, valued function, Lioi's theorem, Measure induced by Random Measure and itsproperties, Randon-Nikodyn, Signed measures, hahn decomposition theorem. Absolutely cotiuous measure, Lebesugue Randuon- Nikodyn theorem.

REFERENCES:

1. Measure and interation : Berbarian. S.K.
2. Measure Theory : Halmos, P.R.

SEM.-2**Paper -3****PAPER CODE-MPMETH203****Fuzzy set Theory and Fuzzy Logic****UNIT-I****CLASSIFICATION OF SETS AND FUZZY SETS:**

Basic concepts of classical set and fuzzy set, basic operations and properties of classical and fuzzy sets, basic concept of classical relation and fuzzy relation and composition.

UNIT-II**MEMBERSHIP FUNCTIONS, FUZZIFICATION AND DEFUZZIFICATIONM FUZZY RELATION AND COMPOSITION:**

Basic concept of function and fuzzy function , standard forms and boundaries, fuzzification, defuzzification, fuzzy numbers and operations. Integration and differentiation of fuzzy functions.

UNIT-III**CLASSICAL LOGIC, FUZZY LOGIC AND FUZZY RULE BASED SYSTEM:**

Basic concept of classical logic fuzzy logic, appropriate reasoning, natural languages, linguistic hedges, fuzzy rule based system.

UNIT-IV**FUZZY NON-LINEAR SIMULATION AND FUZZY DECISION MAKING:**

Fuzzy relational equation, partitioning, non-linear simulation using fuzzy rule based system, fuzzy synthic evaluation, fuzzy ordering, preference & consensus.

UNIT-V**PROBABILITY AND UNCERTAINTY:**

Basic concept of probability theory and possibility, comparison of probability and possibility, fuzzy event, uncertainty, measure of fuzziness.

TEXT BOOKS :

1. Fuzzy logic with engineering application -T.J. Ross, McGraw Hill Pub.
2. First course on fuzzy theory & application- K.H. Lee, Springs Int.:
3. Fuzzy set, Fuzzy logic theory & appl. G.J. Klier, Prentic Hall.
4. Fuzzy set theory & its appl. H.J. Zimmerman, Allied Pub.

SEM.-2

Paper -4
PAPER CODE-MPMETH1204
Real and Functional Analysis

UNIT-I

Real number system as a complete ordered field, Archimedean property, Supremum, Infimum, Limit, Continuity, Differentiability.

UNIT-II

Maclaurin & Taylor series, Definition of a sequence, Theorems on limits of sequences, Bounded and monotonic sequences, Cauchy's convergence criterion, Series of nonnegative terms.

UNIT-III

Comparison test, Ratio test, Leibnitz's theorem, Absolute convergence. Bolzano-Weierstrass theorem, Heine Borel theorem, Continuity, Uniform continuity, Differentiability, mean value theorem, sequences & series of functions, Point wise convergence, limit superior, limit inferior, Uniform convergence.

UNIT-IV

Riemann sums and Riemann integral, Improper integrals, Monotonic functions, types of discontinuity, functions of bounded variations, Lebesgue measure, Lebesgue integral.

UNIT-V

Functional Analysis : Normed linear spaces, Inner product spaces, Orthonormal basis, Spaces of continuous functions, Quotient space, Conjugate space, Banach spaces, Riesz Fischer theorem, Hahn Banach extension theorem, Open mapping theorem, Uniform boundedness principle & its applications, Hilbert spaces, Riesz representation theorem, Projections, Invariant subspaces.

1. Measure and integration : Berbarian. S.K.
2. Measure Theory : Halmos, P.R.
3. Mathematical Principles of Fuzzy logic-Novak , Kluwer Academic Pub.

Paper -5

Subject code-MPMETH205
Dissertation

Students individually will carry out a detail study on a topic and implement a related system. The study must include literature survey, methodology and proposed work, experimental details and results, modifications to be included and future directions, applications etc. A report is to be prepared and submitted under the guidance of a supervisor. The report should contain design, implementation and experimental details. The topics involved in the work should be related to the courses undertaken by the student till this portion of progression under the programme and have contemporary relevance. It can involve research and development oriented works and be carried out with an eye on the needs of the industry. The work must be defended through a presentation in front of a panel constituted by selected experts. The quality of the work should be reflected by at least one publication in conference proceedings/ journals etc.

