M. Phil. Mathematics

(Course intake capacity: 10)

- **Admission** to M.Phil. programme in Mathematics is based on marks obtained in entrance test.

Eligibility and Admission

i) 55% marks at Masterôs degree in Mathematics or grade B according to U.G.C norms of grading system in mathematics for open categories and 50% marks for reserved categories.

Distribution of seats:

70% seats are reserved for the students from this university and 30% are reserved for the students from other universities. There would be over and above quota 20% for other state students.

Course Structure:- M.Phil Mathematics.

Course Code	Title of the Paper	Marks	Credits
MP-101	RESEARCH METHODOLOGY	100	4
MP-101	INFORMATION TECHNOLOGY	100	4
MP-103	FOUNDATIONS OF MATHEMATICS	100	04
MP-104	ADVANCED ANALYSIS	100	04
MP-105	DISSERTATION	150	06
MP-106	VIVA-VOCE	50	02
MP-107	SEMINAR (TWO)	25	01
	TOTAL	625	25

Duration of the course:

The M. Phil. course is a full-time course spread over two academic years. First year is devoted to classroom lecturers and second year is devoted to documentation, laboratory work and preparation of dissertation, etc.

Dissertation of the candidate will be accepted only after completion of the following requirements of the course:

i) Satisfactory attendance (75%)
ii) Passing all the theory papers and
iii) Presenting at-least one research paper at Regional / State / National level Conference / Seminar / Symposium.
iv) A candidate must complete the entire course within a period of Two years from the date of registration.

M. Phil. Mathematics Syllabus

Syllabus of MP-101 and MP-102 are common to all discipline.

MATH-103 FOUNDATION OF MATHEMATICS

UNIT I: Elements of set theory

Countable and uncountable sets, Infinite sets, Cardinal numbers and their arithmetic, Schroeder-Bernstein theorem, Cantorôs theorem and the continuum hypothesis,Poset,Axiom of choice, Hausdorff maximality principle, Tukeyôs theorem, Zornôs lemma, well ordering theorem.

UNIT II: Algebra

Brief Survey of Algebraic Structures such as group, ring, semirings, division ring, field, modules. Field extension, finite fields with properties, Fundamental theorem of Algebra with proofs and its applications. Fundamental group, homology group, division algebra, central simple algebras., Brauer group.

UNIT III: Calculus of Variations

Variational problems with fixed boundaries, Eulerôs equation for functionals containing first order derivative and one independent variable. Extremal. Functionals dependent on higher order derivatives. Functionals dependent on more than one independent variable. Variational problems in parametric form. Invariance of Eulerôs equation under coordinates transformation. Variational problems with moving Boundaries-Functional dependent on one or two functions.One sided variations. Sufficient conditions for an Extremum-Jacobi and Legendre conditions,Second Variation. Variational principle of least action.

UNIT IV: Transforms

(Pre requisites: Bessel functions with properties, Gamma function, Dirac-delta function, Heaviside unit function)

Mellin Transform: Properties, evaluation of Mellin Transform, Complex variable method , applications. Hankel Transform: Properties,evaluation of Hankel Transform, applications.

Reference Books:

1. Robert R. Stoll :Set Theory and Logic, Eurasia Publishing House (P) Ltd. Ram Nagar,New Delhi, 2nd Ed.,1976
2. Seymour Lipschutz : Theory and Problems of Set Theory and Related Topics, Schaum Outline Series, Mc Graw Hill,1964.
3. Kelley J.L.: General Topology ,Van Nostrand Reinhold Co. New York,1955.
4. I.N.Herstein : Topics in Algebra.
5. J.B.Conway : Functions of one Complex Variable, Springer Verlag, New York, 2nd ed., 1997.
6. Allen Hatcher: Algebraic Topology, Cambridge University Press, 2002
7. Schalaurv: Quadratic Forms.
8. A.S. Gupta : Calculus of variations with applications, PHI,1997
9. I.M.Gelfand and S.V.Fomin : Calculus of variations, Prentice-Hall, Englewood Cliffs (New Jersey), 1963.
10. Oden J. T. and Reddy J. N. : Variational Methods in Theoretical Mechanics, Springer-Verlag,1976
11. Larry C. Andrews and Bhimsen K. Shivamoggi : Integral Transforms for Engineers, PHI,3rd Indian Reprint 2003.
12. I.N.Sneddon : The Use of Integral Transforms , McGraw Hill.
13. Ram Shankar Pathak : Integral Transforms of generalised functions and their applications,Gordon and Beach Science Publishers.
14. Herbert Goldstein, Charles P. Poole, John Safko : Classical Mechanics , Pearson Education ,2011.

MATH-104 ADVANCED ANALYSIS

Unit I: Topology: Metric Spaces, Topological Spaces, Compactness, Separation and Connectedness.

Unit II: Functional Analysis: Banach Spaces and Hilbert Spaces.

Unit III: General Preliminaries on Banach Algebra.

Unit IV: The structure of Commutative Banach Algebras, some special commutative Banach Algebras.

Textbooks:

G. F. Simmons, "Introduction to Topology and Modern Analysis" Tata McGraw-Hill Publishing Company Ltd., New Delhi (3^{rd} reprint 2005)

Scope: Chapters 2 to 6, 9, 10, 12, 13 and 14.

Reference Books:

1. E. Taylor and Lay D. "Introduction to Functional Analysis", John Wiley, 2^{nd} Edn(1980).
a. James R. Munkres, "Topology".
2. G. Bachman and L. Narici, "Functional Analysis".
3. Kreyzig, "Introduction to Functional Analysis with Applications", John Wiley and Sons., New York.
4. W. J. Pervin, "Foundation of General Topology".