BHAGWANT UNIVERSITY

Sikar Road, Ajmer

Rajasthan

Syllabus

Institute of Applied Sciences & Life Sciences

M. Phil I Semester

Mathematics

Course Category

MMat : M.Phil in Mathematics
CCC: Compulsory Core Course
ECC: Elective Core Course
Contact Hours:
L: Lecture
T: Tutorial
P: Practical or Other
Marks Distribution :
IA: Internal Assessment (Test/Classroom
Participation/Quiz/Presentation/Assignment etc.)
EoSE: End of Semester Examination

M. Phil (Mathematics)

(Course Structure)

Subject code	Subject Name	Teaching hours			Marks		
		L	T	P	External	Internal	Total
01MMat101	**Research Methodology**	3	0	0	70	30	100
01MMat102	**GENERLIZED HYPERGEOMETRIC FUNCTIONS AND FRACTIONAL CALCULUS**	**3**	**0**	**0**	**70**	**30**	**100**
01MMat103	**ADVANCED**	3	0	0	70	30	100

	OPERATION RESEARCH						
01MMat104	DIFFERENTIAL FORM AND COSMOLOGY	3	0	0	100		100
Total		12	0	0	280	120	400

SEMESTER II

Subject code	Subject Name	Teaching hours			Marks		
		L	T	P	External	Internal	Total
02MMat101	**Advanced Research Methodology**	3	0	0	70	30	100
02MMat102	**Functional Analysis**	**3**	**0**	**0**	**70**	**30**	**100**
02MMat103	**General Skills In Geometry**	3	0	0	70	30	100
02MMat104	**Dissertation**	**3**	**0**	**0**	**50**	**50**	**100**
Total		12	0	0	260	140	400

PAPER 1   RESEARCH METHODOLOGY

01MMat101

Special Function and Generalized Special Function, Generating Function.

Fundamental Tensor, Tensor, Geodesics, Bianchi Identities, Flat Space, Einstein Tensor.

Basic elements of a mathematical Research Paper.

Power Point Presentation of a Research Method/Research Work/Research Paper.

Probability distribution, Normal Distribution, Test of Significance (t, F, X^2, Z), Analysis of variance, Sampling, estimation.

Mathematical Type setting in Equation Editor

Expression, Equation, Matrices Numerical Formulas, Solution of algebraic equation and differential Equations by using matrix operator theory.

Various types of integral & differential operators and their applications in different disciplines.

Geometric properties of generalized functions.

Linear and Non Linear Programming Problems.

PAPER II – GENERLIZED HYPERGEOMETRIC FUNCTIONS AND FRACTIONAL CALCULUS

01MMat102

UNIT :I

Meijer's G-Function: Definition ,Elementary properties, Multiplication formulas

UNIT :II

Derivatives, Recurrence relations Mellin and Laplace transforms of the G-Function.

UNIT:III

H-function of one and two variables: definition, Identities, Special cases, Differentiation formulas,

UNIT:IV

Recurrence and Contiguous function relation, Finite and Infinite series, Simple Finite and Infinite integrals involving H- function .

UNIT :V

Fractional calculus: Riemann Liouville fractional Integrals and Derivatives definition.

References:

1. Mathai and Saxena : Generalized Hyper geometric fuctions with applications in Statistics and Physical Sciences, Springer Veriag
2. Mathai and Saxena : The H- Function with applications in Statistics and other disciplines. Jhon Wiley & Sons. New York.Chapter 1,3
3. Ross and Miller : Fractional Calculus.

PAPER III - ADVANCED OPERATIONS RESEARCH

01MMat103

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.

UNIT :III

Assignment Problem: Traveling Sales person problem.

Queuing Theory: The Birth and Death process, Queuing models involving non-exponential distributions.

UNIT :IV

Project Management: Networks, Shortest Route problem, Minimal spanning tree problem, Maximum flow problem, project planning and control with PERT CPM.

UNIT :V

Simulation: Phases of Simulation model, Monte Carlo Simulation.

References:

1. Operations Research : Hiller & Leberman
2. Analysis of Inventory System : Within and Heddley
3. System Simulation : G. Gordon
4. Operations Research : S.D. Sharma

PAPER IV - DIFFERENTIAL FORM AND COSMOLOGY

01MMat104

UNIT :I

Differential forms in Relativity: Lie derivatives, Symmetry and killing's equations, Spherical symmetric and plane symmetric space-time. Basic ideas, Definition.

UNIT :II

Rimannian Geometry: Basic I- forms, Connection I-forms, Co-ordinate Frame, Equation of structure, Curvature 2-forms, Identities for curvature. Two examples (Vaidya metric &one other.)

UNIT :III

Non-Static Cosmological models: Cosmological Principles; Einstein fields equations in cosmology. Energy momentum tensors of the universe, Hubble's law

UNIT :IV

Weyl's hypothesis. Robertson-Walker metric. Doppler effect in Robertson-Walker metric. Friedmann-Robertson-Walker model. Horizons in FRW models.

UNIT :V

Alternative Cosmologies: Mach's Principle. Brans-Dicke Theory of gravity. Cosmological solutions in the Brans – Dicke theory.

Reference:

1. General Relativity and cosmology   : J.V. Narlikar.
2. Introduction to Cosmology   : J.V. Narlikar.Cambridge. univ.Press.
3. Introduction to General Relativity   : R.Adler, M.Bazin,M.Schffer.
4. Differential forms in general relativity : W. Isreal Dublin.

SEMESTER II

PAPER I –ADVANCED RESEARCH METHODOLOGY(02MMAT101)

Unit I - Types of Research and Report writing

Types of Research: Exploratory Research, Conclusive Research, Modelling Research, Algorthimic Research. Research Process: Problem Definition, Objectives of the Research, Research Design, Data Collection, Data Analysis, Interpretation of Results, Validation of Results. Report Writing and Presentation: Types of Report, Guidelines for Reviewing Draft, Report format, Typing Instructions and Oral Presentation.

Unit II – Modules

Free Modules – Project Modules – Tensor product – Flat Modules.

Unit III - Localization

Ideals, Local Rings, Localization.

Unit IV - The Calculus of variations

Introduction - Existence of minimizers.

Unit V - The Calculus of variations

Regularity, constraints, critical points, problems.

Text Books

"Research Methodology" R.Panneer Selvam,PHI,New Delhi,(Eleventh Printing) 2013. Unit I : Sections 1.4 and 1.5 in Chapter I, Chapter 16
2) Commutative Algebra – N. S. Gopalakrishnan (Oxonian Press, New Delhi), Second   Printing 1988.

PAPER - II – FUNCTIONAL ANALYSIS(02MMAT102)

Unit I:

Topological Vector Spaces – Preliminaries, Separation properties, Linear Mappings, Finite dimensional spaces, Metrization.

Unit II:

Topological Vector Spaces: Continuation of Metrization - Boundedness and Continuity, Seminorms and Local convexity, Quotient spaces, Examples.

Unit III:

Completeness – Baire category theorem, The Banach - Steinhaus theorem, The open mapping theorem, The closed graph theorem, Bilinear mappings.

Unit IV:

Convexity – The Hahn-Banach Theorem, Weak topologies, Compact convex sets.

Unit V:

Duality in Banach spaces-The normed dual of a normed space, Adjoints, Compact operators.

PAPER III – GENERAL SKILLS IN GEOMETRY

Unit I:

Algebraic Results – Areas of triangles – Polar coordinates Equation to a locus – Straight line in Rectangular Coordinates – Polar Coordinates and in Oblique Coordinates.

Unit II:

Two or more straight lines – Transformation of Coordinates – Systems of circles.

Unit III:

 Conic sections – The Parabola – The ellipse – The Hyperbola.

Unit IV:

 Polar equation to a Conic – Tracing of Curves.

Unit V:

 More general equations, the director circle etc.