

DEPARTMENT OF MATHEMATICS

M.PHIL SYLLABUS

Effective from the Academic Year 2015-16



H.H. The Rajah's College

Autonomous

Accredited at B+ by NAAC

Pudukkottai

Sl. No	Semester	Paper title	ExamH rs	Marks		Credits
				Int	Ex	
1	I	Research Methodology	3 Hrs	40	60	4
2	I	Area Paper: Advanced Analysis	3 Hrs	40	60	4
3	I	Guide Papers: (Any One) <ul style="list-style-type: none"> ➤ Fuzzy groups and Fuzzy graphs ➤ Topological vector spaces ➤ Lie Algebra 	3 Hrs	40	60	4
4	I	Teaching and learning Studies	3 Hrs	40	60	4
5	II	Dissertation				8

M. Phil Mathematics
Hard core: ADVANCED ALGEBRA

UNIT I

Definition of Category - examples - isomorphism, automorphism and endomorphism in a category - operation of a group on an object of a category - Universal objects in a category - Products and Coproducts - Covariant and contravariant functors - examples of functors - representation functors and examples - isomorphism of functors - representable functors.

UNIT II

Polynomials and group rings - Localization

UNIT III

Basic definitions relating to modules - Group of homomorphisms - Direct products and sums of modules - Free modules - Vector spaces - The dual space.

UNIT IV

Integral ring extensions - Integral Galois extensions.

UNIT V

Basic Criteria for a Noetherian module - Associated primes - Primary decomposition - Nakayama's lemma.

TEXT BOOKS

1. Serge Lang, "Algebra", Springer - Verlag, Revised Third Edition, 2002.

Unit - I - Chapter I Section 11 excluding the following

- (i) example on Page 60 relating to tensor product of commutative rings
- (ii) example on Page 63 relating to compact manifolds
- (iii) the last example on Page 65 relating to the category of projective non-singular varieties over the complex numbers.

Unit - II - Chapter II sections 3 and 4.

Unit - III - Chapter III: Sections 1 to 6 excluding the following

- (i) example on Page 121 relating to the ring of differential operators with coefficients and the theory of Lie groups
- (ii) example on Page 134 relating to the category of complexes of modules over a ring, vector bundles over a topological space and sheaves of abelian groups over a topological space.

Unit - IV - Chapter - VII : Sections 1 and 2

Unit - V - Chapter - X : Sections 1 to 4.

M. Phil Mathematics
Hard Core: ADVANCED ANALYSIS

UNIT I

Abstract Integration: The concept of measurability - simple functions - Elementary properties of measures - Integration - Convergence theorems - Role played by set of measure zero

Chapter 1

UNIT II

Riesz Representation theorem: Topological preliminaries - Riesz representation theorem - Regularity properties of Borel measures - Lebesgue measure - continuity properties of measurable functions

Chapter 2

UNIT III

L^p spaces: Convex functions and inequalities - The L^p spaces - Approximation by continuous functions

Chapter 3

UNIT IV

Fourier transforms: Formal properties - Inversion theorem - The Plancherel theorem

Chapter 9

UNIT V

Preservation of angles - Linear fractional transformations - Normal families - Riemann Mapping Theorem

Chapter 14 Pages 278-289

TEXT BOOKS

W. Rudin, Real and Complex Analysis, 3rd edition, McGraw Hill International, 1986

REFERENCE(S)

1. Serge Lang, Complex Analysis, Addison Wesley, 1977.
2. V. Karunakaran, Complex Analysis 2 edn, Narosa, New Delhi, 2005.
3. P. Halmos, Measure theory, Springer.

M. Phil Mathematics
SOFT CORE :Fuzzy Groups and Fuzzy Graphs

Unit - I

Basic concepts - notations - subsets - algebra of sets - power sets - relations on sets - definition and examples - cardinality of a set - some operations on set - venn diagram - ordered pairs and n-tuples - cartesian products - examples-relations-types of relations with examples - some operations on relations - composition of relations - functions - types of functions with examples - composition of functions - inverse function - characteristic function of a set - Basic concepts of graph theory, paths , reachability and connectedness , matric representation of graphs - Trees.

Text Book 1 Chapter 2 Section: 2.1,2.3,2.4 and Chapter 5 Section 5.1

Unit II

Fuzzy Sets - fuzzy subgroups - normal fuzzy subgroups - homomorphism and isomorphism - level subgroups - cosets - equivalence classes - fuzzy subgroups based on group properties.

Text Book 2 Chapter 1 Section: 1.1 to 1.4 and Chapter 10 Section: 10.2 and 10.4

Unit III

Properties of normal fuzzy subgroups - Characteristic Fuzzy Subgroups and Abelian Fuzzy Subgroups - Fuzzy Caley's Theorem and Fuzzy Lagrange's Theorem.

Text Book 2 Chapter 2 Section: 2.1 - 2.3

Unit IV

Introduction to fuzzy graphs - fuzzy cut sets, fuzzy chords, fuzzy cotree and fuzzy twigs, fuzzy cocycles - fuzzy cycle set and fuzzy cocycle set - fuzzy line graphs , Fuzzy intersection graphs, Fuzzy interval graphs - The Fulkerson and gross Characterization - The Gilmore and Hoffman Characterization.

Text Book 3 Chapter 2 Section: 2.1 - 2.2

Unit V

Operations on Fuzzy Graphs- Cartesian Product and Composition , Union and Join , On fuzzy Tree definition

Text Book 3 Chapter 2 Section: 2.4 - 2.5

Text Book:

- 1.J.P. Tremblay , R.Manohar, Discrete Mathematical Structures with Applications to Computer Science,Tata McGraw- Hill Edition 1997.
- 2.John N. Mordeson,Kiran R. Bhutani, Azriel Rosenfeld , Fuzzy Group Theory, 2005 , Studies in Fuzziness and Soft Computing, Volume 182 ,ISBN 3-540-25072-7.
- 3.J. N. Mordeson and P.S. Nair, Fuzzy Graphs and Fuzzy Hypergraphs, Physica- Verlag, 2000.

References:

1. VasanthaKandasamy W. B., "Smarandache Fuzzy Algebra ",American Research press, Rehoboth, 2003.
- 2.SurajitBorkotokey, " Advanced Topics in fuzzy algebra", Vdmverlag , paperback ,June-2010.
3. D.S. Malik and J.N. Mordeson, Fuzzy Discrete Structures, Physica - Verlag , 2000.

M. Phil. Mathematics
SOFT CORE : TOPOLOGICAL VECTOR SPACES

Unit I:

Topological vector spaces : Introduction – separation properties – Linear mappings – Finite dimensional spaces – metrization – boundedness and continuity – seminorms and local convexity – quotient spaces – examples.

Unit II:

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

Unit III:

Convexity: The Hahn Banach theorems – Weak topologies – compact convex sets – vector valued integration.

Unit IV:

Duality in Banach spaces: The normed dual of a normed space – Adjoint – compact operators.

Unit V:

A continuity theorem – closed subspace of L^p - spaces – The range of a vector valued measure – A generalized Stone-Weierstrass theorem – two interpolation theorems – Kakutani's fixed point theorem – Haar measure on compact group – uncomplemented subspaces.

Text book:

Walter Rudin, Functional Analysis, 2nd edition, Tata McGraw-Hill, New Delhi, 2006.

Reference:

John. B. Conway, A course in Functional analysis, 2nd edition, GTM, Springer, New Delhi, 2006.

M. Phil. Mathematics
SOFT CORE : LIE ALGEBRA

Unit I :

Basic Concepts of Lie Algebras: Definitions and examples.

Unit II :

Ideals and homomorphisms

Unit III :

Solvable and nilpotent Lie algebras

Unit IV :

Semisimple Lie algebras : Theorems of Lie and Cartan, Killing form

Unit V :

Complete reducibility of representations and representation of $sl(2, F)$.

Text book:

James E. Humphreys, Introduction to Lie Algebra and Representation theory, Springer, New Delhi, 2010.

M. Phil. Mathematics
TEACHING AND LEARNING STUDIES

Unit I: Computer applications skills

Computer system: Characteristics, Parts and their functions – Different generations of computer – operation of computer: switching on/off/restart, Mouse control, use keyboard and some functions of key – information and communication technology (ICT): definition, meaning, features, trends – Integration of ICT in teaching and learning – ICT applications: Using word processor, spread sheets, power point slides in classroom – ICT for research: Online journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations.

Unit II: Communication Skills

Communication: Definitions - Elements of communication: Sender, message, channel, receiver, Feedback and noise – Types of communication: Spoken and written; Non-verbal communication – Barriers to communication: Mechanical, Physical, Linguistic & cultural – Skills of communication: Listening, speaking, reading and writing - Methods of developing fluency in oral and written communication – Style, Diction and vocabulary – classroom communication and dynamics.

Unit III: Communication Technology

Communication Technology: Bases. Trends and Developments – Skills of using communication Technology – computer mediated teaching: Multimedia, E-content - Satellite-based communication: EDUSAT and ETV Channels. Communication through web: Audio and video applications on the internet, interpersonal communication through the web.

Unit IV: Pedagogy

Instructional Technology: Definition, Objectives and types – Difference between teaching and instruction – Lecture Technique: Steps, Planning of a lecture, Delivery of a lecture – narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration: Characteristic, principles, Planning Implementation and evaluation – Teaching – learning Techniques: Team teaching, Group discussion, Seminar, workshop, Symposium and panel discussion – modes of teaching: CAI, CMI and WBI.

Unit V: Teaching Skills

Teaching skill: Definition, Meaning and nature – Type of teaching a skills: Skill of set induction, skill of stimulus variation, skill of explaining, skill of probing questions, skill of black board writing and skill of closure – Integration of Teaching skills – Evaluation of teaching skills.

References

1. Bela Rani Sharma, Curriculum reforms and teaching methods, Sarup and sons, New Delhi, 2007.

2. Don Skinner, Teacher training, Edinburgh Universitypress Ltd., Edinburgh, 2005.
3. Information and communication technology in Education: A curriculum for schools programme of teacher development, Jonathan Anderson and Tom Van Weert, UNESCO, 2002.
4. Kumar, K.L, Educational Technology, New age international publishers, New Delhi 2008.
5. Mangal, S.K, Essential of teaching - Learning and information Technology, Tendon Publication, Ludhiana, 2002.
6. Michael, D and William, Integrating Technology into teaching and learning: concepts and applications, Prentice Hall, New York, 2000.
7. Pandey, S.K, Teaching communication, common wealth publisher, New Delhi, 2005.
8. Ram Babu, A and Dandapani, S, Microteaching (Vol. 1 & 2), Neelkammal Publications, Hyderabad, 2006.
9. Singh V. K and Sudarshan K.N, computer education, Discovery Publishing Company, New York, 1996.
10. Sharma, R.A, Fundamental of educational technology, Surya Publications, Meerut, 2006.
11. Vanaaja, M, and Rajasekar, S, Computer Education, Neelkammal Publications, Hyderabad, 2006.