



Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University under Category A by MHRD, Estd. u/s 3 of UGC Act 1956)

Re-accredited with A+ Grade by NAAC. Recognised by UGC Under Section 12 B

Coimbatore - 641 043, Tamil Nadu, India

Department of Mathematics

Ph.D. Mathematics

Ph.D Programme Specific Outcomes:

1. Acquire knowledge on latest topics of mathematics
2. Identify and formulate research problems in the thrust areas
3. Expertise on writing thesis

Scheme of Instruction and Examination

(Applicable for Ph.D Scholars admitted from 2020-2021 & onwards)

Subject code	Title of the Paper	Hours of instruction / week	Scheme of Examination				Credits
			Duration of exam	CIA	CE	Total	
21PHMA01	Research Methodology in Mathematics	7	3	60	40	100	5
21PHMA02	Applications of Algebra, Real Analysis and Topology	7	3	60	40	100	6
	Specialization Paper		3	60	40	100	5
20PHMA04	Research and Publication Ethics (RPE)	2	3	60	40	100	2
	Thesis			100	100	200	12
Total Credits							30

Department of Mathematics
Ph.D. Mathematics
21PHMA01 RESEARCH METHODOLOGY IN MATHEMATICS

Hours of instruction: 7 Hrs./week

No. of Credits: 5

Objectives:

- To provide the overview of research methodology
- To learn and apply graph theory tools in solving practical problems
- To understand the concept of fuzzy sets and their operations

Unit I: *Research Methodology*

Meaning of Research – Objectives of Research – Significance of Research – Research and Scientific Method – Significance of report writing – Different steps in writing report- Layout of the Research – Mechanics of writing a Research Report – Precautions of writing Research Reports.

Unit II: *Domination in graphs*

Dominating sets in Graphs – Sets of representatives – Applications of Domination numbers.

Unit III: *Bounds on the Domination number*

Bounds on the Domination number – Bounds in terms of order , Degree , Packing, size, Diameter, Girth, Independence and Covering.

Unit IV: *Fuzzy Sets*

Fuzzy Sets – Basic types – Basic Concepts - α - cuts – Additional properties of α - cuts – Extension principle for Fuzzy sets.

Unit V: *Operations on Fuzzy Sets*

Operations on Fuzzy sets – Types of Operations – Fuzzy complements-t-Norms-Fuzzy Unions-Combinations of operations.

Total Hrs.: 105

Course Outcomes:

On completion of the course, the students will be able to

- write the thesis efficiently
- apply principles of graph theory in practical situation
- learn the concepts of fuzzy set theory
- apply the concept of fuzzy sets to real life problems

Text Books:

1. *C.R.Kothari (2007)*. “Research Methodology” New Age International (P) limited, New Delhi, second edition.
2. *Teresa W.Haynes, Stephen T.Hedetniemi, Peter J. Slater*, Fundamentals of Domination in Graphs, 1998 – CRC Press.
3. *George J.Klir and B.Yuan*, Fuzzy sets and Fuzzy Logic , Prentice Hall of India, New Delhi, 2004.

References:

1. *R.Balakrishnan and K.Ranganathan*, A Text Book of Graph Theory, Springer, 2012.
2. *H.J.Zimmermann*, Fuzzy Set theory and its Applications , Allied Publishers limited, New Delhi ,1991.

Unit	Text Book	Chapter	Sections
II	2	1	1.1 to 1.13
III	2	2	2.1 to 2.5
IV	3	1 & 2	Fully
V	3	3	Fully

Department of Mathematics
Ph.D. Mathematics
21PHMA02 APPLICATIONS OF ALGEBRA, REAL ANALYSIS AND TOPOLOGY

Hours of instruction: 7 Hrs./week

No. of Credits: 6

Objectives:

- To establish Noetherian modules on commutative ring
- To apply lattice theory to Jordan Holder Dedekind Theorem
- To learn the conditions of metrizable of a topological space
- To understand the applications of spectral theory

Unit I: Commutative Algebra

Free modules – Projective modules – Tensor Products – Flat modules- Ideals – Local rings – Localization - Noetherian modules – Primary decomposition – Artin in module– Length of a module

Unit II: Lattice

Lattices – Fundamental – Lattice Theory – Modular Lattices – Jordan Holder Dedekind Theorem.

Unit III: Analysis

General preliminaries on Banach Algebra – The definitions and some examples, Regular and singular elements, Topological divisors of zero, the spectrum, The formula for the spectral radius, The radical and semi – simplicity

Unit IV: Banach Algebra

The structure of commutative Banach Algebra – the Gelfand mapping, applications of the formula $r(x) = \lim_{n \rightarrow \infty} \|x^n\|^{1/n}$, Involutions in Banach Algebras, The Gelfand-Neumark theorem.

Unit V: Topology

Local Finiteness – The Nagata-Smirnov Metrization Theorem – Paracompactness – The Smirnov Metrization Theorem.

Total Hrs.: 105

Course Outcomes:

On completion of the course, the students will be able to

- access properties of ideals on local rings.
- acquire knowledge of Noetherian modules and Artinian modules.
- solve problems using lattices.
- apply the concepts of Paracompactness in topology and differential geometry
- obtain the knowledge of uniting topological sides with Algebraic structure.

Text Books:

1. *N.S.Gopalakrishnan*, Commutative Algebra, Second Edition University press, 2016. (Unit I)
2. *SannandersMaclane and Garrett Birkhoffi*, Algebra, second edition Macmillan Pub Co, INC, 1999. (Unit II)
3. *G.F.Simmons*, Introduction to Topology and Modern Analysis, Tata McGraw-Hill Publishing Company Limited, 2009. (Unit III & IV)
4. *James R. Munkres*, Topology (2nd edition), Prentice Hall of India, Pvt .Ltd., New Delhi, 2004. (Unit V)

Reference:

1. *I.M. Singer and J.A. Thorpe*, Lecture Notes on Elementary Topology and Geometry, Springer Verlag, 2004.