

**PG AND RESEARCH**

**DEPARTMENT OF MATHEMATICS**

***Hajee Karutha Rowther Howdia College,***

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai)

Re-Accredited with “A” Grade by NAAC – (CGPA of 3.26 out of 4.00)

***Uthamapalayam – 625 533.***

***Theni District. Tamilnadu***



**Syllabus for M.Phil., Mathematics**

**(w.e.f 2015-16)**

**HAEE KARUTHA ROWTHER HOWDIA COLLEGE (AUTONOMOUS)**

**UTHAMAPALAYAM**

**M.Phil MATHEMATICS SYLLABUS 2015-2016 Onwards**

**I Semester**

**Three Theory Papers Code**

Paper I- Research Methodology: Associative Algebra	15MMAC11
Paper II- Advance Mathematics: Advanced Analysis	15MMAC12
Paper III- Optional (Elective: One to be choosen)	
1. Graph Theory	15MMAE11
2. Commutative Algebra and Generalized Inverses of Matrices	15MMAE12
3. Distribution Theory	15MMAE13
4. Stochastic Process	15MMAE14

**For each paper- Internal 40 marks and external 60 marks**

**Mark splitting pattern (Internal):**

Conducting three tests (Average of Best two) - 25 marks

Seminar - 15 marks

No marks for assignment

**II Semester:**

**Dissertation only- 200 marks**

Evaluation of dissertation - 150 marks

(Average of internal and external examiners)

Viva- voce - 50 marks

**Question pattern**

Max. marks: 60

Time 3 hrs.

**Part A (5x6 = 30 marks)**

Answer **ALL** questions choosing either (a) or (b)

(One question from each unit with internal choice)

**Part B (3x10 = 30 marks)**

Answer **ANY THREE** questions (out of five questions)

(one question from each unit)

### M.Phil Scheme of Examination

Semester	Code	Paper	Credit	Internal Marks	External Marks	Total Marks
<b>I</b>	15MMAC11	Research Methodology: Associative Algebra	4	40	60	100
	15MMAC12	Advance Mathematics: Advanced Analysis	4	40	60	100
	15MMAE11 <b>Or</b>	Optional Paper – I Graph Theory	4	40	60	100
	15MMAE12 <b>Or</b>	Optional Paper – II Commutative Algebra and Generalized Inverses of Matrices	4	40	60	100
	15MMAE13 <b>Or</b>	Optional Paper – III Distribution Theory	4	40	60	100
	15MMAE14	Optional Paper – IV Stochastic Process	4	40	60	100
<b>II</b>	15MMACEV	Dissertation	8	150	50	200
	Total		20	270	230	500

## I SEMESTER

CORE PAPER I	CODE: 15MMAC11	Research Methodology	HOURS-5 / CREDITS - 5
-----------------	----------------	----------------------	-----------------------

### Unit I

Associative algebra – Group algebras – Endomorphism algebra- Matrix algebras- Quaternion algebra – Finite dimensional algebras – Quaternion algebras- Isomorphism of Quaternion algebras.

### Unit II

Modules – Changes of scalars – Lattice of Sub modules – Simple modules – Semi simple modules – structure of semi simple modules – Chain conditions – The Radical of ring – tensor product of modules.

### Unit III

Structure of semi simple algebras – Semi simple – Minimal right ideals – Simple algebras – Matrices of homeomorphisms - The density theorem – Wedderburn structure theorem – Mascheke's theorem.

### Unit IV

The Radical – radical of an algebra – Nakayam's Lemma – The Jacobson radical – The radical of an Artinian algebra – Nilpotent algebras- The radical of a Group algebra – Ideals in Artinian Direct decompositions – Local algebras – Fitting's lemma.

### Unit V

Simple algebras – centers of simple algebras – The density theorem The Jacobson – Bourbaki theorem – Central simple algebras- The Braner Group - The Noether – Skolem Theorem – The Double Centralizer Theorem.

### Text Book

R.S.Pierce **"The Associative Algebras"** GIM 88, Springer Verlag 1982.

<b>Unit I</b>	:	Chap I (page no 1 -20)
<b>Unit II</b>	:	:Chap 2 & 9(Sec.9.1) (Page No. 21 – 38 & 157-163)
<b>Unit III</b>	:	Chap 3 (Page No.40-54)
<b>Unit IV</b>	:	Chap 4 (Page No 55-71) & Chap 5 (72-76)
<b>Unit V</b>	:	:Chap 10 (Page No.218-233)

## I SEMESTER

CORE PAPER II	CODE: 15MMAC12	<b>ADVANCE MATHEMATICS</b>	HOURS-5 / CREDITS - 5
------------------	----------------	----------------------------	-----------------------

### Unit I

Abstract Integration:

Set – Theoretic notations and terminology – The concept of measurability – Simple functions – Elementary properties of measures – Arithmetic on  $[0, \infty]$  – integration of positive functions – integration of complex functions – The role played by sets of measure zero.

### Unit II

Positive Borel Measures:

Vector spaces – Topological preliminaries – The Riesz – Representation theorem – Regularity properties of Borel measure.

### Unit III

Lebesgue Measure:

Lebesgue measure – continuity properties of measurable functions.

### Unit IV

$L^p$  – Spaces:

Convex functions and inequalities – The  $L^p$  – Spaces – Approximation by continuous functions.

### Unit V

Fourier transforms:

Formal properties – The inversion Theorem – The Plancherel theorem – The Banach algebra  $L^p$

### Text book:

Real and Complex Analysis (III-Edition) Walter Rudin Mc Graw – Hill International Editions 1987 Chap : 1,2, 3&9

## I SEMESTER

<b>OPTIONAL PAPER (ELECTIVE)</b>	<b>CODE: 15MMAE11</b>	<b>GRAPH THEORY</b>	<b>HOURS-5 / CREDITS - 5</b>
--	-----------------------	---------------------	------------------------------

### **Unit I :**

Domination in Graphs – Dominating sets in graphs – Bounds on the domination number in terms of order, size, degree, diameter and girth.

### **Unit II :**

Changing and unchanging properties of domination parameters.

### **Unit III :**

Factorization and decomposition of Graphs – Graceful labeling of graphs – Harmonious labeling of graphs.

### **Unit IV :**

The Ramsey number of graphs – Turan's theorem – Rainbow Ramsey theorem.

### **Unit V :**

Product Graphs.

### **Text Book :**

1. T.W.Haynes, S.T.Hedetniemi and P.J.Slater, Fundamentals of Domination in Graphs, Marcel Dekker Inc.1998.
2. G.Chartrand and L.Lesniak, Graphs and Digraphs, Fourth Edition, Chapman and Hall CRC, 2005.
3. Gary Chartrand and Ping Zhang, Introduction to Graphs Theory, Tata Mcgraw- Hill, 2005
4. A Text Book of Graph Theory Volume I and II by R.Balakrishnan and Renganathan.

**Unit I :** Text Book 1, Chapter 1, Sections 1,2, Chapter 2, Sections 2.1 to 2.4.

**Unit II :** Text Book 1, Chapter 5, Sections 5.1 to 5.3

**Unit III :** Text Book 2, Chapter 9, Sections 9.2 to 9.3

**Unit IV :** Text Book 3, Chapter 11, Sections 11.1 to 11.3

**Unit V :** Text Book 4

**Reference Books :**

1. V.R.Kuli, Theory of domination in graphs, Vishwa International Publications, Gulbarga, 2010.
2. K.R.Parthasarathy, Basic Graph Theory, Tata Mcgraw – Hill Publishing Company, 1994
3. Douglas West, Introduction in Graph Theory, Prentice, Hall of India, 2010.

**2. Commutative Algebra & Generalized inverses Matrices**

1. Generalized Inverses : Theory and Applications , Adi Ben – Israel, Thomas N.E.Greville, Chapter 1, Chapter 2 and Chapter 3 (omit sections 3.3 and 3.4)

**3. Distribution Theory**

1. Functional Analysis, W.Rudin, Part 2-Chapter 6 and Chapter 7.
2. Distribution Theory, Technical Report 2, DSA, School of Mathematics, Madurai Kamaraj University.

**4. Stochastic Process**

1. Stochastic processes, Second Edn., J.Medhi, New Age International Publishers, Chapters 6,7,8,9