

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)

Re-accredited (**3rd Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF MATHEMATICS-M.Phil



CBCS

MASTER OF PHILOSOPHY

COURSE STRUCTURE

(w.e.f. 2021 – 2022 Batch onwards)

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC**CBCS****DEPARTMENT OF MATHEMATICS- M.Phil**

(w.e.f 2021 – 2022 onwards)

Sem	Subject Code	Title of the Paper	Teaching hrs/week	Exam Duration hrs	Marks Allotted		
					CIA	SE	Total
I	19LM11	Research Methodology	6	3	40	60	100
	19LM12	Advanced Analysis	6	3	40	60	100
		(**)Optional paper	6	3	40	60	100
II	19LMPD2	Dissertation	6	-	-	200	200
	19LMPV2	Viva Voce					

() One paper from the following four papers may be chosen as optional.**

1. 19LMO1A **Advanced Graph Theory**
2. 19LMO1B **Fuzzy Theory**
3. 19LMO1C **Distribution Theory**
4. 19LMO1D **Homological Algebra**

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.**(An Autonomous Institution Affiliated to Madurai Kamaraj University)****Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC****CBCS****DEPARTMENT OF MATHEMATICS- M.Phil****(w.e.f 2021 – 2022 onwards)****Title of the paper : Research Methodology****Semester : I****Sub Code : 19LM11****Contact hours: 6****Objectives :**

1. To provide an exposure to Research Methodology
2. Enabling to learn more concepts in Commutative Algebra to develop logical and mathematical thinking.

Unit-I Research Methodology:

1. What is Research in Mathematics?-Fixing an area for research, Proof Techniques- Pure and Applied Mathematics Research – Articles (popular Technical, Review, Survey) Magazines, Journals-Websites related to Mathematical articles and software(free and commercial),Mathematical and Statistical Societies (National and International), Prizes and Medals in Mathematics.

2. Dissertation -Thesis-Expository-Research Paper-Abstract, review- Referee. Components of Dissertation and Thesis- Difference between Dissertation and Thesis.

3. Document Preparation –PowerPoint Presentation-Poster Presentation-using the special software like MS-Word-Scientific Word-Latex AMS classification-Impact Factor- Citation Index- Search engines and how to search using Google main and Google.

Unit-II

Rings and Ring homomorphisms – Ideals, quotient rings – Zero- divisors, Nilpotent elements, Units – Prime ideals and maximal ideals –Nil radical and Jacobson radical –

Operations on ideals – Extension and contraction – Modules and module homomorphisms – Submodules and quotient modules – Operations on sub modules – Direct sum and product - Finitely generated modules – Exact sequences.

Unit-III

Tensor product of modules – Restriction and extension of scalars – Exactness properties of tensor product – Algebras – Tensor product of algebras – Rings and Modules of fractions - Local properties – Extended and contracted ideals in rings of fractions.

Unit-IV

Primary decomposition – Chain conditions.

Unit-V

Noetherian rings - Primary decomposition in Noetherian rings – Artin rings.

Text Books:-

1. J.Anderson et al., *Thesis and Assignment writing*(Unit I) Wiley Eastern 1977.
2. M.F.Atiyah & I.G.Macdonald, *Introduction to Commutative Algebra*, Addison-Wesley Publishing Company, 1969.

Chapters:-

- UNIT-I : Chapter 1 (Book1)
- UNIT-II : Chapter 1: Pages (1 to 9) (Book 2)
Chapter 2: Pages (17 to 24) (Book 2)
- UNIT-III : Chapter 2: Pages (24 to 31) (Book2)
Chapter 3: Pages (36 to 43) (Book2)
- UNIT-IV : Chapter 4: Pages (50 to 55) (Book2)
Chapter 6: Pages (74 to 79) (Book2)
- UNIT-V : Chapter 7: Pages (80 to 84) (Book2)
Chapter 8: Pages (89 to 91) (Book2)

Reference Books:-

1. N.S.Gopalakrishnan , *University Algebra* ,Revised Second Edition , New Age International Publishers.
2. Serge Lang, *Algebra*, III Edition, International Student Edition.

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC**CBCS****DEPARTMENT OF MATHEMATICS- M.Phil**

(w.e.f 2021 – 2022 onwards)

Title of the paper : Advanced Analysis**Semester : I****Sub Code : 19LM12****Contact hours : 6****Objective:**

Enabling to learn more concepts in Functional Analysis.

Unit - I :**Topological vector spaces** - Separation properties– Linear mappings- Finite dimensional spaces.**Unit - II****Metriization** – Boundedness and continuity – Seminorms and local convexity – Quotient spaces.**Unit - III****Completeness** - Baire category – The Banach – Steinhaus theorem – The open mapping theorem – The closed graph theorem – Bilinear mappings.**Unit - IV****Convexity** - The Hahn - Banach theorems – Weak topologies – Compact convex sets – vector-valued integration – Holomorphic functions.**Unit- V****Duality in Banach Spaces** - The normed dual of a normed space – Adjoints Compact operators.**Text Book : -**Walter Rudin, *Functional Analysis* TMH Edition, 2006.

Chapters:-

- UNIT-I : Chapter 1: (Sections 1.1 to 1.23)
- UNIT-II : Chapter 1: (Sections 1.24 to 1.42)
- UNIT-III : Chapter 2: (Sections 2.1 to 2.17)
- UNIT-IV : Chapter 3: (Sections 3.1 to 3.32)
- UNIT-V : Chapter 4: (Sections 4.1 to 4.25)

Reference Books:

1. Balmohan V. Limaye, *Functional Analysis*, Second Edition, 1996.
New age International Publishers.
2. G.F Simmons, *Introduction to Topology and Modern Analysis*,
TMH Edition 2004, Tata McGraw –Hill Education Private Limited.

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.**(An Autonomous Institution Affiliated to Madurai Kamaraj University)****Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC****CBCS****DEPARTMENT OF MATHEMATICS- M.Phil****(w.e.f 2021 – 2022 onwards)****Title of the paper : Advanced Graph Theory****Semester : I****Sub Code : 19LMO1A****Contact hours : 6****Objective:**

To provide an advanced knowledge in Graph Theory and provide strong foundation for further research.

UNIT-I**Graph colorings**-Vertex colorings-Edge colorings-Map colorings and flows**UNIT-II**

Matchings and Independence in Graphs - K – factor - odd components-Tuttes theorem - Covering number - Independence number.

UNIT-III

Factorization and Decomposition - Factorization - 1,2, Hamiltonian factorizations - Decomposition - Cyclic , P_3 , K_3 ,regular H ,Tree, Forest decomposition .

UNIT-IV**Labeling of Graphs** - Graceful,Harmonious Labellings**UNIT-V**

Domination in Graphs - Minimal dominating set-Nordhans-Gaddum bounds-Independent Domination Number- Irredundance number.

Text Book: -

G.Chartrand and Lesniak *Graphs and Digraphs*, Fourth Edition Chapman & Hall/CRC, 2004.

Chapters:-

- UNIT-I : Chapter 8: (Sections 8.1 - 8.3)
- UNIT-II : Chapter 9 : (Section 9.1)
- UNIT-III : Chapter 9 : (Section 9.2)
- UNIT-IV : Chapter 9 : (Section 9.3)
- UNIT-V : Chapter 10: (Sections 10.1 - 10.3)

Reference Books:-

1. Douglas.B. West *Introduction to Graph Theory*, Second Edition PHI Learning Pvt., Ltd.,(2009)
2. V. Krishnamurthy *Harary Graph Theory*, Narosa Publishing House Pvt. Ltd., (2001).

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC**CBCS****DEPARTMENT OF MATHEMATICS- M.Phil**

(w.e.f 2021 – 2022 onwards)

Title of the paper : Fuzzy Theory**Semester : I****Sub Code : 19LMO1B****Contact hours : 6****Objective :**

To provide an advanced knowledge in Fuzzy Theory.

Unit-I**Fuzzy sets:** Basic Types - Basic concepts.**Unit-II****Fuzzy sets versus crisp sets:** Additional properties of x - cuts

Representations of Fuzzy sets - Extension principle for Fuzzy sets.

Unit-III**Fuzzy complements, Fuzzy intersection:** t – Norms - Fuzzy Unions - t -Conorms.**Unit-IV****Fuzzy numbers** - Linguistic variable Arithmetic operations on intervals -

Arithmetic operations of Fuzzy numbers.

Unit-V**Fuzzy Relations** - Crisp versus Fuzzy Relations - Projections & Cylindric

Extensions - Binary Fuzzy Relations - Binary relations on a single set.

Text Book:-George J.Klir/Bo Yuan *Fuzzy Sets and Fuzzy Logic: Theory and Application* , Prentice Hall , 1995 .

Chapters:-

UNIT-I : Chapter 1 : Sections (1.3 & 1.4)

UNIT-II : Chapter 2 : Sections (2.1 to 2.3)

UNIT-III : Chapter 3 : Sections (3.2 to 3.4)

UNIT-IV : Chapter 4 : Sections (4.1 to 4.4)

UNIT-V : Chapter 5 : Sections (5.1 to 5.5)

Reference Books:-

1. Bhargava A.K, *Fuzzy Set Fuzzy Logic and their Applications* ,
S.Chand & Company PVT Ltd 2013
2. George J. Klir and T.A. Folger, *Fuzzy Set, Uncertainty and
information* Prentice hall of India

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC**CBCS****DEPARTMENT OF MATHEMATICS- M.Phil**

(w.e.f 2021 – 2022 onwards)

Title of the paper : Distribution Theory**Semester : I****Sub Code : 19LMO1C****Contact hours : 6****Objective :**

To provide an advanced knowledge in Distribution Theory.

UNIT-I**Test Function** – Introduction - Test function spaces - Calculus with distributions - Location.**Unit –II****Distributions** - Supports of distributions - Distributions as Derivatives - Convolutions.**Unit-III****Fourier Transform** - Basic properties - Tempered distributions - Paley –Winer theorems - Sobolev's lemma.**Unit-IV****Applications to Differential Equation** - Fundamental solution - Elliptic equation.**Unit:V****Tauberian theory** - Wiener's theorem - Prime number theorem - Renewal equation.**Text Book: -**Walter Rudin, *Functional Analysis*, T M H Edition 1974, 10th Reprinted 1986.**Chapters:-**

UNIT-I : Chapter 6 : Sections(6.1 to 6.21)

UNIT-II : Chapter 6: Sections (6.22 to 6.37)

UNIT-III : Chapter 7: Sections (7.1 to 7.24)

UNIT-IV : Chapter 8: Sections (8.1 to 8.5)

UNIT-V : Chapter 9: Sections (9.1 to 9.4)

Reference Books:-

1. Balmohan V. Limaye, *Functional Analysis* , Revised Second Edition,
New age International Publishers .
2. Walter Rudin ,*Real & complex Analysis*, Tata McGraw-Hill Edition

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC**CBCS****DEPARTMENT OF MATHEMATICS- M.Phil**

(w.e.f 2021 – 2022 onwards)

Title of the paper : Homological Algebra**Semester : I****Sub Code : 19LMO1D****Contact hours : 6****Objective :**

To provide an advanced knowledge in Homological Algebra.

UNIT-I

Rings and Modules - Projective modules - Injective modules semi-simple rings - Hereditary rings - Additive Functors - Definitions & Examples - operators - Preservation of exactness.

UNIT-II

Homology – Modules with differentiations - The ring of dual numbers - Graded modules complexes - Double gradings & Complexes - Functors of complexes .

UNIT –III

Derived Functors - Complexes over modules - resolutions Resolutions of sequence - Definitions of derived functors - Connecting homomorphism.

UNIT-IV

The function R^0T & L^0T Comparison with satellites comparison - computational devices - partial derived functors.

UNIT-V

Derived Functors of X & Homological of modules and rings - kunnet relation - change of rings - Duality homomorphisms.

Text Book:-

Henri Cartan and Samuel Eilenber , *Homological Algebra*, New Age International Publishers,2007.

Chapters:-

UNIT I : Chapter 1 : Section (1.1 to 1.5)(Not for examination)

Chapter 2 : Section (2.1 to 2.4)

UNIT II : Chapter4 : Section(4.1 to 4.5)

UNIT-III : Chapter 5 : Section(5.1 to 5.4)

UNIT-IV : Chapter 5 : Section (5.5 to 5.8)

UNIT-V : Chapter6 : Sections (6.1 to 6.5)

Reference Books:-

- 1.S.Gopalakrishnan , *University Algebra* ,Revised Second Edition , New Age International Publishers.
2. Serge Lang , *Algebra*, III Edition , International Student Edition .
3. I.S. Luthar, I.B.S. Passi, *Algebra, Volume 3*, Narosa Publishing House 2010.

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC**CBCS****DEPARTMENT OF MATHEMATICS- M.Phil**

(w.e.f 2021 – 2022 onwards)

QUESTION PAPER PATTERN FOR M.Phil**INTERNAL**

Part	No.of Questions	Marks	Total	Choice
A	4	5	20	4 out of 6
B	3	10	30	3 out of 5

* No blue print for Internal.

* Two internal tests with maximum marks 50 are to be conducted and be converted to a maximum of 25 marks.

* Average of the **Two** tests is to be taken for the final assessment.**Allotment of Internal Marks:****THEORY**

Test : 25 Marks

Assignment : 5 Marks

Seminar : 10 Marks

Internal Maximum : 40 Marks

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.**(An Autonomous Institution Affiliated to Madurai Kamaraj University)****Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC****CBCS****DEPARTMENT OF MATHEMATICS- M.Phil****(w.e.f 2021 – 2022 onwards)****QUESTION PAPER PATTERN FOR M.Phil****EXTERNAL**

Part	No.of Questions	Marks	Total	Choice
A	5	6	30	5 out of 8
B	3	10	30	3 out of 5

- Atleast **One** and atmost **TWO** questions from each unit are to be given in **PART-A**
- One question from each unit are to be given in **PART-B**

Results are to be declared as per the norms given below:

Course	Continuous Internal Assessment (CIA)	Summative Examination		Aggregate Marks CIA+SE	
	Maximum Prescribed	Passing Minimum	Maximum Prescribed	Passing Minimum	Maximum Prescribed
M.Phil., (Theory)	40	27	60	50	100
Dissertation	40	-	60	50	100
Viva -voce	-	-	100	50	100

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI-14.**(An Autonomous Institution Affiliated to Madurai Kamaraj University)****Re-accredited (3rd Cycle) with Grade A⁺ and CGPA 3.51 by NAAC****CBCS****DEPARTMENT OF MATHEMATICS- M.Phil****(w.e.f 2021 – 2022 onwards)****Teaching Schedule:** 30 hours per week shall be the teaching schedule.**For Semester-I:** 30 hours can be split as follows:

Work	Number of Papers	Hours	Total hours
Teaching	3	6	18
Tutorial	3	1	3
Seminar	3	2	6
Library	3	1	3
		Total	30

For semester-II : 30 hours can be split as follows.

Collection of Reference materials

- Preparation of Rough draft -10 hours
- Preparation of Dissertation -10 hours
- Discussion with the Guide -10 hours

Atleast **ONE** and atmost **TWO** questions from each unit are to be given in **PART-A**

ONE question from each unit is to be given in **PART-B**.

Results are to be declared as per the norms given below:

Course	Continuous Internal Assessment (CIA)	Summative Examination		Aggregate Marks CIA+SE	
		Passing Minimum	Maximum Prescribed	Passing Minimum	Maximum Prescribed
M.Phil., (Theory)	Maximum Prescribed 40	Passing Minimum 27	Maximum Prescribed 60	Passing Minimum 50	Maximum Prescribed 100

Dissertation - 100

Viva –voce - 100

Total 200

Passing Minimum : 100