

PERIYAR UNIVERSITY

Re-accredited with 'A' grade by the NAAC

PERIYAR PALKALAI NAGAR

SALEM - 11



M.Phil. Mathematics

(SEMESTER PATTERN)

(Under Choice Based Credit System)

(For University Department)

REGULATIONS AND SYLLABUS

(For candidates admitted from 2016-2017 onwards)

PERIYAR UNIVERSITY, SALEM –11

M.Phil., Mathematics - CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS AND SYLLABUS

(For the candidates admitted from 2016-2017)

1. DURATION OF THE COURSE

The duration of the M.Phil. Programme shall be one year consisting of two semesters under Choice Based Credit System.

2. ELIGIBILITY FOR ADMISSION

A Master degree in Mathematics of Periyar University or any other university recognized by the Syndicate as equivalent thereto, provided that those who have qualified for the Master's degree prior to 1st January 1991 must have secured a minimum of 50 percent of marks and those who have qualified for the Master's degree on or after 1st January 1991 must have secured a minimum of 55 percent of marks. For SC / ST candidates who have qualified on or after 1st January 1991 a concession of 5 percent of marks shall be given in the minimum eligibility marks.

3. DISTRIBUTION OF CREDIT POINTS

The minimum credit requirement for one year M.Phil, programme shall be 24 Credits. The break-up of credits for the programme is as follows:

PART – I

- Core Course : 4 credits
- Core Course : 4 credits
- Elective Course : 4 credits

PART – II

- Dissertation : 8 credits
- Viva Voce : 4 credits

4. Course of Study:

The courses of study for the M.Phil. Degree shall be in Mathematics (under Choice Based Credit System) with internal assessment according to syllabi prescribed from time to time. The **Internal Assessment** is distributed to **Tests, Seminar, Assignment** and **Attendance** as **10, 05, 05** and **05** marks, respectively.

There are three courses under Part-I for Semester I and Dissertation & Viva Voce under Part-II for Semester II. The Third Course in the first semester shall be

specialization related to the dissertation. The student in consultation with the research supervisor must select the third course and the research supervisor should frame the syllabus.

Total marks : **500**
 For each paper : **100** (Internal 25 Marks + External 75 Marks)
 Dissertation : **200** (Internal Valuation 75 + External Valuation 75
 and Joint Viva Voce 25 + 25 Marks]

5. STRUCTURE OF THE PROGRAMME

Course Code	Title of the Course	Core/Elective	Credits			
			L	T	P	C
I SEMESTER (Part-I)						
16URMAT0C01	Research Methodology	Core	3	1	0	4
16URMAT0C02	Algebra and Design Theory	Core	3	1	0	4
*16URMAT0E01	Specialization Course	Elective	3	1	0	4
II SEMESTER (Part-II)						
16URMAT0D01	Dissertation	Core	-	-	-	8
	Viva Voce	Core	-	-	-	4

*16URMAT0E01- Guide Paper

- L – Lecture, T – Tutorial, P – Practical, C – Credits

5. SCHEME OF EXAMINATION

Part-I Written Examination:

For the purpose of uniformity, particularly for interdepartmental transfer of credits, there shall be a uniform pattern of examination to be adopted by all the teachers offering courses. There shall be three tests, one seminar and one assignment for internal evaluation and End semester examination during each semester.

The distribution of marks for internal evaluation and End Semester Examination shall be 25 marks and 75 marks, respectively. Further, distribution of internal marks shall be 10 marks for test, 5 marks for seminar, 5 marks for assignment and 5 marks for attendance, respectively. The average of the highest two test marks out of the three internal tests should be taken for Internal Assessment.

Part-II – Dissertation:

The exact title of the dissertation shall be intimated within one month after the registration of the Programme. Candidates shall submit the dissertation to the university through the supervisor and Head of the Department at the end of the year from the commencement of the programme which shall be valued by internal examiner (supervisor) and one external examiner appointed by the university from a panel of four names sent by the supervisor through the Head of the Department at the time of submitting the dissertation.

The examiners who value the dissertation shall report the merit of candidates as “**Highly Commended**” (75% and above) or “**Commended**” (50% and above and below 75%) or “**Not Commended**” (below 50%).

If one examiner commends the dissertation and the other examiner, does not commend, the dissertation will be referred to the third examiner and the third valuation shall be final.

Submission or resubmission of the dissertation will be allowed twice a year subject to the University rules.

7. Question Paper Pattern:

Time: 3 Hours

Maximum Marks: 75

Part – A (10 X 2 = 20 Marks)

Answer **ALL** Questions

(Two questions from each unit)

Part – B (5 X 5 = 25 Marks)

Answer **ALL** Questions

(Two questions from each unit with internal choice)

Part – C (3 X 10 = 30 Marks)

Answer any **THREE** questions out of **FIVE** questions

(One question from each unit)

8. Dissertation:

(a) Topic:

The topic of the dissertation shall be assigned to the candidate within one month (based on paper III) after registration and a copy of the same should be submitted to the university for approval.

(b) Number of copies of dissertation:

The students should prepare two copies of dissertation and submit the same to the University for the Evaluation.

Format to be followed:

The format of the dissertation to be submitted by the students is given below:

Format for the preparation of project work:

- (a) Title page
- (b) Bonafide Certificate
- (c) Acknowledgement
- (d) Table of contents

CONTENTS

CONTENTS

Chapter No.	Title	Page No.
1.	Introduction	
2.	Review of Literature	
3.	Summary	
4.	Results	
5.	References	

Format of the Title Page

TITLE OF THE DISSERTATION

Dissertation Submitted in partial fulfilment of the requirement for the award of Degree of Master of Philosophy in **MATHEMATICS** to the Periyar University, Periyar Palkalai Nagar, Salem – 636 011.

By

Student's Name :
Register Number :
Department/College :
Month and Year :

Format of the Certificate

CERTIFICATE

This is to certify that the dissertation entitled ...(Title)....submitted by(Candidate Name)..... to the Periyar University, Periyar Palkalai Nagar, Salem in partial fulfilment of the requirement for the award of Degree of Master of Philosophy in **Mathematics** is a bonafide record of work carried out by the candidate during in the Department and that no part of the dissertation has been submitted for the award of any Degree / Diploma / Associateship / Fellowship or other similar titles that the dissertation represents independent work on part of the candidate under my guidance.

Date:

Place:

Signature of the Guide

Signature of the Head of the Department

9. Passing Minimum:

A candidate shall be declared to have passed Part-I of the examination if he/she secures not less than 50% of the marks in each course.

A candidate shall be declared to have passed Part-II of the examination if his/her dissertation is atleast commended.

A candidate who has passed all the examinations under both parts and earned a minimum of 24 credits shall be considered to have passed the M.Phil programme.

10. Restriction in number of chances:

No candidate shall be permitted to reappear for the written examination in any paper for more than two occasions or to resubmit a Dissertation more than once. Candidates shall have to qualify for the degree passing all the written papers and dissertation within a period of two years from the date of joining the course.

11. Commencement of this regulation:

These regulation and syllabi shall take effect from the academic year 2015 –2016 that is, for those admitted to the Programme during the academic year 2015 – 2016 and thereafter.

SEMESTER I (PART I)

16URMAT0C01	RESEARCH METHODOLOGY	L+T+P = C 3 +1 +0 = 4
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Unit-I: Technical Writing

Basic Elements – Identification of the author and his writing - Chapters and sections – Numbering of elements

Unit-II: Topological Vector Spaces

Introduction – Separation properties – Linear mappings – Finite-dimensional spaces – Metrization – Boundedness and continuity – Seminorms and local convexity

UNIT III: Completeness

Quotient spaces – Examples – Baire category – The Banach-Steinhaus theorem – The open mapping theorem – The closed graph theorem – Bilinear mappings

UNIV IV: Sobolev Spaces

Holder Spaces – Sobolev spaces – Approximation – Extensions – Traces

UNIT V: Second-Order Elliptic Equations

Definitions – Elliptic equations – Existence of weak solutions – Regularity

TEXT BOOKS:

1. **B.N. Basu**, “*Technical Writing*”, PHI, Pvt., Ltd., New Delhi, 2007.
2. **W.Rudin**, “*Functional Analysis*”, 2nd Edition, Tata McGraw-Hill, New Delhi, 2006.

3. **L.C. Evans**, "*Partial Differential Equations*", American Mathematical Society, Volume 19, Rhode Island, 2002.

UNIT	Chapter/Book	Sections / Pages
I	4, 5, 6, 8 of [1]	4.1 – 4.5, 5.1 – 5.4
II	1 of [2]	3 – 30
III	1, 2 of [2]	30 – 55
IV	5 of [3]	5.1 – 5.5
V	6 of [3]	6.1 – 6.3

REFERENCE BOOKS:

1. **J. Anderson, B. H. Durston, M. Poole**, "*Thesis and Assignment Writing*", John Wiley & Sons, 1989.
2. **D. H. McBurney**, "*Research Methods*", Thomson Asia Pvt., Ltd., 2002.
3. **A. Browder**, "*Introduction to Function Algebras*", Mathematics Lecture Notes Series, W.A.Benjamin, New York, 1969.
4. **J. L. Kelley** and I. Namioka, "*Linear Topological Spaces*", D. Van Nostrand Company, Princeton, N.J., 1963.
5. **G. Kothe**, "*Topological Vector Spaces*", Springer-Verlag, New York, vol.1, 1969; vol.2, 1979.
6. **H. Brezis**, "*Functional Analysis, Sobolev Spaces and Partial Differential Equations*", Springer, New York, 2011.
7. **S. Kesavan**, "*Topics in Functional Analysis and Applications*", New Age International, New Delhi, 2008.
8. **E. H. Lieb and M. Loss**, "*Analysis*", Graduate studies in Mathematics, Volume 14, American Mathematical Society, 2013.

16URMAT0C02	ALGEBRA AND DESIGN THEORY	L+T+P = C 3 +1 +0 = 4
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Unit I: Modules

Modules – free modules – exact sequences – homomorphisms – tensor product of modules – direct and inverse limits – pull back and push out.

Unit II: Categories and Functors

Categories – functors – equivalent categories - the functors Hom and Tensor.

Unit III: Projective and Injective Modules

Projective Modules – projective basis theorem - Injective Modules – Bear’s Criterion – divisible modules - an embedding theorem.

Unit IV: Designs

Block designs – resolvability- Latin squares-pair wise balanced designs- systems of distinct representatives – finite fields – exercises.

Unit V: Orthogonal Latin Squares

Early results – orthogonal arrays – using pair wise balanced designs – the collapse of the Euler conjecture – transversal designs – transversal designs and orthogonal arrays – group divisible designs – exercises.

TEXT BOOKS:

1. **L.R.Vermani**, Elementary Approach to Homological Algebra, Chapman and Hall / CRC Monographs and Surveys in Pure and Applied Mathematics, Volume 130, CRC Press LLC, Florida, 2003.
2. **Ian Anderson**, “*Combinatorial Designs and Tournaments*”, Clarendon Press, Oxford, 1998.

UNIT	Chapter/Book	Section
I	I of [1]	1.1 to 1.7
II	II of [1]	2.1 to 2.3
III	III of [1]	3.1 to 3.4
IV	I of [2]	1.1 to 1.7
V	IV of [2]	4.1 to 4.8

REFERENCE BOOKS:

1. **T.Y. Lam**, "*Lectures on Modules and Rings*", GTM Vol.189, Springer-Verlag, New York, Inc., 1999.
2. **F.W. Anderson and K.R. Fuller**, "*Rings and Categories of Modules*", GTM Vol.13, Springer-Verlag, New York, Inc., 1992.
3. **L.H. Rowen**, "*Ring Theory*", Academic Press, Inc., San Diego, CA.
3. **Yury J.Ionin and Mohan S, Shrikande**, "*Combinatorics of Symmetric Designs*", Cambridge University Press, 2006
4. **Charles C. Lindner, C.A. Rodger**, "*Design Theory*", CRC Press, 2009.
5. **W.D Wallis**, "*Introduction to Combinatorial Designs*", 2nd Edition, Chapman & Hall/ CRC, 2007.

16URMAT0E01	SPECIALIZATION COURSE	L+T+P = C 3 +1 +0 = 4
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The students must select the course from advanced research areas in Mathematics and the syllabus should be framed by the respective research supervisor. The syllabus along with two different sets of question papers may be communicated to the controller of examinations. The semester examination for Specialization Course will be conducted by the controller of examinations along with core courses.

SEMESTER II (PART II)

16URMAT0D01	DISSERTATION	<i>Dissertation:</i> 8 Credits <i>Viva Voce:</i> 4 Credits
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