# PERIYAR UNIVERSITY

## PERIYAR PALKALAI NAGAR
## SALEM - 11


**DEGREE OF MASTER OF PHILOSOPHY**

**CHOICE BASED CREDIT SYSTEM**

**SYLLABUS FOR M.PHIL. MATHEMATICS**

**FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2012 – 2013 ONWARDS**

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# PERIYAR UNIVERSITY

## PERIYAR PALKALAI NAGAR

### SALEM – 11

## DEGREE OF MASTER OF PHILOSOPHY (M.PHIL) IN MATHEMATICS

## (Choice Based Credit System)

## (for Periyar university Affiliated Colleges)

### REGULATIONS AND SYLLABUS

### FULL – TIME / PART –TIME

**1. Eligibility for Admission:**

Candidates who have passed M.Sc Mathematics of this University or any other University recognized by the Syndicate as equivalent thereto shall be eligible to register for the Degree of Master of Philosophy (M.Phil.) in Mathematics and undergo the prescribed course of study in an approved institution or department of this University.

Candidates who have passed their postgraduate degree in Mathematics on or after 1st January 1991 shall be required to have obtained a minimum of 55% of marks to become eligible to register for the Degree of Master of Philosophy (M.Phil.) and undergo the prescribed course of study in an approved Institution or department of this University.

In the case of teachers (or) others registering for part time registration, the minimum percentage of marks for registration is 50%.

For the candidates belonging to SC/ST community and those who have qualified for the Master's Degree after 01.01.1991 the minimum eligibility marks shall be 50% in their Master's Degree.

**2. Duration of the course:**

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

**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 (Choice Based Credit System) with internal assessment according to syllabi prescribed from time to time. The **Internal Assessment** mark is distributed to 3 components viz **Tests, Seminar** and **Attendance** as **10**, **10** 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 cosultation with the research supervisor must select the third course and the research supervisor should frame the syllabus.

Total Number of Marks : **500**
For Each Paper : **100** (Int. 25 + Ext. 75)
Dissertation : **200** [Internal Valuation 75 + External Valuation 75
Joint Viva Voce 25 + 25]

**5. Structure of the Programme:**

| S. No | Paper | Paper code | Title of the paper | Hrs | Credit | Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CIE | EA | Total |
| **I SEMESTER (Part I)** | | | | | | | | |
| 1 | Paper - 1 | 12QMATC01 | Research Methodology, Algebra and Topology | 6 | 4 | 25 | 75 | 100 |
| 2 | Paper – 2 | 12QMATC02 | Analysis and Differential Equations | 6 | 4 | 25 | 75 | 100 |
| 3 | Paper – 3 | 12QMATE01 | Guide Paper | 6 | 4 | 25 | 75 | 100 |
| **II SEMESTER (Part II)** | | | | | | | | |
| 4 | Dissertation | 12QMATD01 | Dissertation | 12 | 8 | - | 150 | 200 |
| | | | Viva Voce | | 4 | - | 50 | |

**5. Scheme of Examinations (Two Semesters):**

**Part-I Written Examination:**

The examination for the courses I, II and III under Part-I shall be held at the end of the **FIRST SEMESTER**. Each course carries a maximum of 100 marks of which 75 allotted for external and 25 for internal. The internal assessment mark is distributed to 3 components viz tests, seminar and attendance as 10, 10 and 05 marks, respectively.

The syllabus for paper III shall be framed by the Guide and the same should be submitted to the University for Approval.

The examination of paper III will be conducted by the Guide in the College/Departments and the marks obtained by the candidate along with the question paper and valued answer scripts shall be sent to the university at least 15 days before the commencement of the examinations of Papers I and II.

The examiners will be appointed from the panel of four names of each paper (I and II) submitted by the College/Departments concerned. If one examiner awards a pass mark and the other fail mark, the paper will be valued by a third examiner whose award of marks will be final.

**Part –II – Dissertation:**

The exact title of the dissertation shall be intimated within one month after the registration of the course. Candidates shall submit the dissertation to the university through the supervisor and Head of the Department at the end of the **SECOND SEMESTER** from the commencement of the course 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 / Principal 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.

**6. Question paper pattern:**

Time : Three Hours Maximum Marks : 100

**Part – A ( 5 X 5 = 25 Marks)**

Answer **ALL** questions

(Two questions from each unit with internal choice)

**Part – B (5 X 15 = 75 Marks)**

Answer **ALL** questions.

(Two Questions from each unit with internal choice)

**7. 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. The maximum marks for submitting the dissertation is **150 marks.**

**b) Number of copies of Dissertation:**

The students should prepare **two copies** of dissertation and submit the same to the university for the evaluation.

**c) External viva-voce compulsory:**

There is a compulsory viva-voce by an external examiner and the maximum marks for the viva-voce is **50 marks**.

**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



## *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, 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

**8. Passing Minimum:**

The candidate shall be declared to have passed Part–I of the examination if he/she secures not less than 50% marks (i.e. 50 marks) in the University examination in each paper.

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

All other candidates shall be declared to have failed in the examination.

**9. 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 three years from the date of joining the course.

**10. Conferment of Degree:**

No candidate shall be eligible for conferment of the M.Phil. Degree unless he/she is declared to have passed both the parts of the examination as per the Regulations.

**11. Qualifications for persons conducting the M.Phil. Course:**

No teacher shall be recognized as a supervisor unless he/she possesses a Ph.D. degree or two years of PG teaching experience after qualifying for M.Phil. or M.Litt. Degree.

Only the postgraduate departments of affiliated colleges and departments of the university will be recognized for conducting the M.Phil. Course; provided however, the syndicate shall have the power to decide any other institutions of higher learning/research within the university area for conducting the M.Phil. Course on merits as per the regulations of Periyar University..

**PART – TIME M.Phil, Mathematics**

**12. Eligibility for Admission:**

i) Teacher candidates working in the Mathematics Department of the University.

ii) Teacher candidates working in the Department of Mathematics of affiliated colleges and whose qualifications are approved by the university.

iii) Teacher candidates working in polytechnics approved by the Director of Technical Education or in Higher Secondary Schools and High Schools approved by State Board or Central Board of Secondary Education or Educational Institutions of IAF (within Periyar University area) who possess a Master's Degree. For the Master's Degree qualified prior to 01.01.1991, no minimum marks is prescribed; but on or after 01.01.1991, a minimum of 55% of the marks is prescribed, provided that for the candidates belonging to SC/ST community a concession of 5% marks will be given in the minimum eligibility marks prescribed.

**13. Duration of the course:**

The course of study extends over period of two years from the date of admission to the course. The examinations for part – I shall be taken at the end of the first year and part – II Dissertation at the end of the second year.

**14. Regulations for the part – time M.Phil.,:**

The regulations governing the full time M.Phil., course with regard to course of study, scheme of examinations passing minimum, etc and qualifications of guide conducting the M.Phil., course shall apply to part – time candidates also.

**15. Restriction in number of chances:**

No candidate shall be permitted to reappear for the written examination in any paper on 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 four years from the date of commencement of the course.

**16. Commencement of this regulation:**

These regulations shall take effect from the academic year 2012 – 2013, that is, for students who are admitted to the first year of the course during the academic year 2012 – 2013 and thereafter.

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# I SEMESTER (Part I)

**PAPER I**

**12QMATC01 RESEARCH METHODOLOGY, ALGEBRA AND TOPOLOGY**

**L + T + P = C**

3 + 1 + 0 = 4

(L – Lecture, T – Tutorial, P – Practical, C – Credits)

**Unit I:**

Method of Research: Identification of the problem – Literature survey – Reference collection - Internet browsing – Assessing the current status – Mode of approach actual investigation – Results and discussion – Conclusion – Presenting a scientific seminar – Synopsis writing – Art of writing a research paper and thesis – Multimedia techniques in papers presentation – Power point – Presentation and chart.

**Unit II:**

Homomorphisms of modules – Direct summands – Direct sums and product of modules – Decomposition of rings – Semi simple modules – The socle and the radical – Finitely generated and finitely co generated modules – Chain conditions (Chapter 1: 3,

Chapter 2: 5,6,7, Chapter 3: 9,10)

**Unit III:**

Modules with composition series – Indecomposable - decomposition of modules – Semi simple rings – The Density theorem – The radical of a ring – Local rings and Artinian rings

(Chapter 3: 11, 12, Chapter 4: 13, 14, 15)

**Unit IV:**

Fundamental group and covering spaces: Homotopy – Fundamental group – Covering spaces – Simplicial complexes – Geometry of simplicial complexes – Bary centre subdivision – Simplicial approximation theory

**Unit V:**

Manifolds – Differential manifolds – Differential form – Miscellaneous facts.

**Text Books:**


1. Thesis and assignment writing – J. Anderson, B.H.Durston and M.Poole, Wiley Eastern(1977)
2. F.W. Anderson and K.R.Fuller, Rings and Categories of Modules, 2nd Edition, Graduate Texts in Mathematics, Vol.13, Springer – Verlag, New York, 1992.
3. Lecture Notes on Elementary Topology, I.M.Singer and J.A.Thotpe, Springer Verlag, New York, 1967


**Reference Books:**


1. How to write a research paper – Berry.
2. A handbook of Methodology of Research – Rajammal P.Devadas, R.M.M Vidyalaya Press(1976)
3. T.Y. Lam Lectures on Modules and Rings, Graduate Texts in Mathematics, Vol.189, Springer – Verlog, New York, 1999.
4. L.H. Rowen, Ring Theory, Vol I, II, Academic Press, New York, 1988.
5. R. Wisbaver, Foundations of Module and Ring Theory, Gordon and Breach, Philadelphia, 1991.
6. Topology, J.G. Hocking and G.S. Young , Addition – Wesley Pub. Co. Mass 1961
7. Introduction to Differentiable Manifolds, L.Auslander and R.f Mackenzie, McGraw- Hill, New York, 1963

**PAPER II**

## 12QMATC02 ANALYSIS AND DIFFERENTIAL EQUATIONS

**L + T + P = C**

3 + 1 + 0 = 4

(L – Lecture, T – Tutorial, P – Practical, C – Credits)

**Unit I:**

The Concepts of measurability – Simple functions – Elementary properties of measures – Integration of +ve functions – Integration of complex functions – The role played by sets of measure zero- $L^p$ – Spaces: Convex functions and inequalities – The $L^p$ – Spaces – Approximation by continuous functions.

(Chapter 1: page (8 – 18) page (19 -31) Chapter 3: page (61 – 71)

**Unit II;**

Elementary Hilbert Space Theory: Inner products and linear functionals – Orthonormal sets. Examples of Banach Space Techniques: Banach spaces – Consequences of Baire's Theorem - The Hahn – Banach Theorem

(Chapter 4: page(76 – 87) (Chapter 5: page (95 – 100) page (104 – 108).

**Unit III:**

Fourier Transform : Formal properties – The inversion theorem – The Plancherel theorem – The Banach algebra L' – Two theorems of Paley and Wiener

(Chapter 9: page (178 – 193) Chapter 19 : page(372 – 376)

**Unit IV:**

**Nonlinear Differential Equations:**

Analysis and Method of Nonlinear Differential Equations – Existence Theorem – Extremal solutions – upper and lower solutions – Bihari Inequality – Variation of parameters.

**Unit V:**

**Boundary Value Problems:**

Boundary Value Problems – Introduction – Sturm Lioville problem – Green's function – application of Boundary Value Problems – Picard's Theorem – Oscillation of second order equations – Fundamental Results – Sturms Comparison Theorem.

**Text Books:**

1. Real and Complex Analysis, 3rd edition by Walter Rudin, McGraw Hill Book Company, New York.
2. S.G.Deo, V.Lakshmikantham and V.Ragavendra, Text Book of Ordinary Differential Equations, Tata McGraw Hill Publ. co. New Delhi, 1997.

**Reference Books:**

1. W.Coppel, Stability and Asymptotic Behavior of Differential Equations, heath Boston, 1965.
2. P.Bailey, L.Shampine and P.Waltman, Nonlinear Two Point Boundary Value Problems, Academic Press, New York, 1968.

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**PAPER III**

**12QMATE01** **GUIDE PAPER**
**(Specialization course)**

**L + T + P = C**

3 + 1 + 0 = 4

(L – Lecture, T – Tutorial, P – Practical, C – Credits)

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.

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## *II SEMESTER (*Part II*)*

**12QMATD01** **DISSERTATION**

**Dissertation:** 08 Credits

**Viva Voce:** 04 Credits

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