ANNEXURE 18B03

V.V. VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

CHOICE BASED CREDIT SYSTEM

REGULATIONS AND SYLLABUS

(with effect from Academic Year 2018 - 2019)

V.V. Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 19 UG Programmes, 14 PG Programmes, 6 M.Phil. Programmes and 3 Ph.D. Programmes. All these programmes, except Ph.D. Programmes, have been framed as per the guidelines given by UGC under Choice Based Credit System (CBCS).

The Departments of Commerce, English and History upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The students' performance will be evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS/Elective Course System is implemented

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UG PROGRAMMES

Arts & Humanities : History (E.M. & T.M.), English , Tamil

Physical & Life Sciences : Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology, Computer Applications.

Commerce & Management : Commerce, Commerce with Computer Applications, Commerce with Professional Accounting Business Administration

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Biochemistry, Food Processing & Quality Control, Chemistry, Zoology, Computer Science, Information Technology, Computer Applications (MCA*)
Commerce & Management	:	Commerce, Business Administration (MBA*) * AICTE approved Programmes

PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Biochemistry
Commerce & Management	:	Commerce

OUTLINE OF CHOICE BASED CREDIT SYSTEM (M.Phil.)

1. Core Courses
2. Discipline Specific Elective Course
3. Dissertation

ELIGIBILITY FOR ADMISSION

A pass in M.Sc. Mathematics Degree from any recognized University.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of one academic year (two semesters).

MEDIUM OF INSTRUCTION

English

EVALUATION SCHEME

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	40	60	100
Dissertation	75	75	150
Viva-Voce	-	50	50

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation		Marks
Periodic Test	:	20
Assignment	:	10
Seminar	:	10
Total	**:**	**40**

Three Periodic Tests - Average of the best two will be considered

Two Assignments   - Better of the two will be considered

Question Pattern for Periodic Tests   **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Max. Marks
A Q.No.(1 - 4)	Internal Choice Either Or Type	4	4	5	20
B Q.No.(5-7)	Open Choice	3	2	10	20
				Total	**40**

EXTERNAL EXAMINATION

Question Pattern   **Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each question	Total Marks
A Q.No.(1 - 5)	Internal Choice Either Or Type (one set from each unit)	5	5	6	30
B Q.No.(6-10)	Open Choice (one from each unit)	5	3	10	30
				Total	**60**

ELIGIBILITY FOR THE DEGREE

1. The candidate will not be eligible for degree without completing the prescribed Courses of study and a minimum of 50% Pass marks in all the Courses.

2. Attendance, progress and conduct certification from the Head of the Institution will be required for the students to write the examination.

    ➢ No Pass minimum for Internal Assessment.

    ➢ Pass minimum for External Examination is 27 marks out of 60 for Core Courses and Discipline Specific Elective Courses.

3. One paper presentation in a Seminar/Conference outside the College is mandatory for the submission of the Dissertation.

4. Pre-Viva presentation in the presence of all faculty members in the department is compulsory for M.Phil. Scholars.

5. Soft copy of the Dissertation is to be checked for plagiarism and certificate issued by the Librarian in this regard is to be attached to the Dissertation on submission.

ATTENDANCE

The following rules are applicable to the students of all UG, PG and M.Phil. Programmes with effect from 2018-2019.

a) The students with an attendance of 85% and above are permitted to appear for the Summative Examinations without any condition.

b) The students with 78% - 84 % of attendance are permitted to appear for the Summative Examinations by paying a fine of ₹500/-

c) The students with 66% - 77% of attendance can appear for the Summative Examinations only after getting special permission from the Principal. Special permission shall be granted by the Principal only on medical grounds and those students should also pay a fine of ₹1000/- along with the application form for exemption. If permission is not granted, they have to appear for the Summative Examinations in the next Semester by paying a fine of ₹1000/-

d) The students who have less than 65% of attendance cannot appear for the Summative Examinations and have to repeat the whole semester .

e) For Part V Courses, the students require 75% of attendance to get the required credit.

f) For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

MASTER OF PHILOSOPHY (MATHEMATICS)
Programme Code - 0214

PROGRAMME OUTCOMES

➢ Enhance the advanced learning and in-depth knowledge in the specified discipline.

➢ Empower the perceptual observation, analytical conception and qualitative research.

➢ Enrich the research with globally competent principles, methodologies and practical applications.

➢ Develop the argumentative skill to justify and defend the findings related to the research.

➢ Sustain the research capability to meet the emerging needs of contemporary social changes.

PROGRAMME SPECIFIC OUTCOMES

The scholars will be able to

+ acquire a comprehensive view about the latest trends in Mathematics

+ gain an indepth knowledge about the mechanics of writing research articles, projects and dissertation

+ understand and use the methodology for documenting and citing sources in research articles, projects and dissertation.

+ pursue a doctoral degree in Mathematics and in any other interdisciplinary areas of knowledge

+ procure placement in schools and colleges as teachers

+ appear for Competitive Examinations and Civil Service Examinations

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MASTER OF PHILOSOPHY (Mathematics) - 0214

Programme Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2018-2019

Components	Semester		Total Number of Hours (Credits)
	I	**II**	
Core Course	6 (4)	-	6 (4)
Core Course	6 (4)	-	6 (4)
Discipline Specific Elective Course	6 (4)	-	6 (4)
Dissertation and Viva- Voce	-	0 (8)	0(8)
Total	**18 (12)**	**0 (8)**	**18(20)**

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PROGRAMME CONTENT
SEMESTER I

S.No.	Components	Title of the Course	Course Code	Hours per Week	Credits	Exam. Hours	Marks		
							Int.	Ext.	Total
1	Core Course-1	Research Methodology	18MPMTC11	6	4	3	40	60	100
2	Core Course-2	Algebra and Analysis	18MPMTC12	6	4	3	40	60	100
3	Discipline Specific Elective Course -1	Bitopology and Algebraic Graph Theory / Differential Equations and Automata Theory	18MPMTE11 / 18MPMTE12	6	4	3	40	60	100
		Total		18	12				300

SEMESTER II

S.No.	Components	Course Code	Credits	Marks		
				Int.	Ext.	Total
1.	Dissertation	18MPMTD21	4	75	75	150
2.	Viva-Voce	18MPMTV21	4	-	50	50
		Total	8			200

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VIRUDHUNAGAR - 626 001

M.Phil. MATHEMATICS

(2018 -19 onwards)

Semester I	**RESEARCH METHODOLOGY**	Hours/Week: 6	
Core Course		Credits: 4	
Course Code **18MPMTC11**		Internal 40	External 60

COURSE OUTCOMES

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

- ❖ bridge the gap between 'being a student' and 'being a scholar'.
- ❖ master over the traditional/conventional procedures in writing a thesis and decide whether to adopt them or to adapt to new things.
- ❖ think of taking 'Job Typing' as 'Work from Home'.
- ❖ type a well organized, legible and neat M.Phil. Project in LATEX.

UNIT I

Assignments and Thesis at the Tertiary Level

Writing at the tertiary level: Theses and dissertations-Conventions of writing-the question of style. **Planning the Assignment:** Defining the problem-Limiting the problem – A time schedule-Consulting source material – Preparing a working bibliography - Taking notes. **Planning the thesis**: Selecting a topic-reviewing the literature-Designing the study-The chapter outline.   (20 Hours)

UNIT II

Writing the Thesis or Assignment

The general format: The Preliminaries - The text-The reference material.

Page and chapter format: Chapter divisions and subdivisions – Spacing – Pagination – Margins – Paragraphs indentation – **Referencing**: Reference systems-Essential information –Spacing capitalisation and underlining-Alphabetical and chronological order.   (15 Hours)

UNIT III

Research in Mathematics - Proof techniques (Proof by induction, proof by contradiction and constructive proof only) – Mathematical Journals – AMS subject classification (primary and secondary. Main subjects only) - Impact factor - Citation index - Search engines. (25 Hours)

UNIT IV

Formatting first – Itemizing and numbering – Displaying mathematics – General – Spacing of mathematical symbols – Referencing and citing – Examples of array environment, align environment, matrices created with array, table created with array – Section headings – Changing fonts. (15 Hours)

UNIT V

The anatomy of an article - The type set sample article-Editing the top matter – Sectioning – Invoking proclamation – Inserting references- On using latex - Converting an article to a presentation - Preliminary changes - Making the pages.

(15 Hours)

TEXT BOOKS

1. Anderson, J., Durston, B.H. & Poole, M. (1977). *Thesis and Assignment Writing*, Wiley Eastern Ltd.
2. Penner, R. C. (1999). *Discrete Mathematics Proof Techniques & Mathematical Structures,* World Scientific Company.
3. *Rafal Ablamowicz,* A Graduate students Guide to Latex and AMS Latex.
4. David R.Wilkins. (1996). *Getting Started with Latex,* 2nd edition.
5. George Gratzer. (2007). *More Maths into Latex*, Springer Science + Business Media, 4th Edition LLC.

Unit	Text book	Chapter	Section/Page
I	1	Part - I	Page 4-12,15 - 21
II	1	Part - 2	Page 35 – 50, 53-57, 94-97
III	given at the bottom of the table		
IV Latex	3	3	3.1- 3.5
		4	4.1 -4.5
	4	2	2.5, 2.6
V	5	4	4.1 -4.4

Unit-III: Refer respective website addresses

1. Mathematical Journals (National and International)

2. DOAJ (doaj.org)

3. Digital Library of Sciences (gallup.unm.edu)

4. AMS subject classification (ams.org)

5. Google search engines (main and scholar).

6. For Proof Techniques refer ' Discrete Mathematics Proof Techniques &

   Mathematical Structures – R. C. Penner'.

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M.Phil. MATHEMATICS

(2018 -19 onwards)

Semester I	ALGEBRA AND ANALYSIS	Hours/Week: 6	
Core Course		Credits: 4	
Course Code **18MPMTC12**		Internal 40	External 60

COURSE OUTCOMES

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

- ❖ understand the notion of tensor in modules.
- ❖ recognise the special features of Noetherin rings and Artin rings.
- ❖ understand the elementary theory of Banach Algebra.
- ❖ give fourier transform for a given function f.
- ❖ construct the structure of modular and distributive lattices.

UNIT I - MODULES

Exact sequences – Tensor product of Modules - Restriction and extension of scalars – Exactness properties of the Tensor product – Algebras – Tensor product of Algebras**.** (18 Hours)

UNIT II - NOETHERIAN RINGS AND ARTIN RINGS

Noetherian rings - Hilbert basis theorem-primary decomposition in Noetherian Rings-Artin rings-structure theorem for Artin rings. (17 Hours)

UNIT III - DISTRIBUTIVE AND MODULAR LATTICES

Distributive lattices –Modular lattices – Characterization of modular and distributive lattices by their sublattices –The isomorphism theorem of modular lattices, Covering conditions. (20 Hours)

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UNIT IV - FOURIER TRANSFORMS

Formal Properties- The Inversion Theorem-The Plancherel Theorem-The Banach Algebra L^1 (16 Hours)

UNIT V - ELEMENTARY THEORY OF BANACH ALGEBRAS

The Invertible Elements – Spectral Radius Formula – Ideals and Homomorphisms – Quotient Spaces and Quotient Algebras – Quotient Norms. (19 Hours)

TEXT BOOKS

1. Atiyah, M.F. & Macdonald, I.G. (1969). *Addison Introduction to Commutative Algebra*, Wesly Publishing Company.

2. Gabor Szasz. (1963). *Introduction to Lattice Theory*, New York and London : Academic Press, , Third Revised and Enlarged Edition.

3. Walter Rudin. (2014). *Real and Complex Analysis*, McGraw Hill, Third Edition, Eighteenth Reprint.

Unit	Text Book	Chapter	Section/Page
I	1	2	Pages : 22 - 35
II	1	7 8	Pages : 80 – 88 Pages : 89 - 92
III	2	4	Sections : 30, 32, 33, 35
IV	3	9	Pages : 178 - 193
V	3	18	Pages : 357 - 365

REFERENCE BOOKS

1. Introduction to Rings and Modules – C.Musili, Narosa Publishing House, Second Revised Edition, 1994.

2. General lattice Theory - George Gratzer , The university of Manitoba, New York, San Francisco, 1978.

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M.Phil. MATHEMATICS

(2018 -19 onwards)

Semester I	**BITOPOLOGY AND ALGEBRAIC GRAPH THEORY**	Hours/Week: 6	
Discipline Specific Elective Course		Credits: 4	
Course Code **18MPMTE11**		Internal 40	External 60

COURSE OUTCOMES

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

- ❖ impart the recent topics in Topology.
- ❖ elucidate the concepts and techniques of bitopological spaces.
- ❖ understand the concepts of bitopological connectedness and compactness.
- ❖ successfully enter into the research literature and to attack important open questions in Modern Algebraic Graph Theory.
- ❖ Have a clear picture of the inter link between Algebra and Graph Theory.

UNIT I - Bitopological Separation

Pairwise T_1 and T_2 Spaces - Pairwise Regular Bitopological Spaces - Quasi-Metrizable Bitopological Spaces - Pairwise Normal Bitopological Spaces.

(16 Hours)

UNIT II : Bitopological Separation

Pairwise Completely Normal Bitopological spaces – Solved Problems

Bitopological Connectedness and Compactness

Pairwise Connectedness - Zero Dimensional Spaces   (20 Hours)

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UNIT- III :Bitopological Connectedness and Compactness

Pairwise Compact Spaces – Bitopological Local Compactness - Pairwise Lindelof Space– Solved Problems

Graphs

Circulant Graphs, Johnson Graphs, Line Graphs   (16 Hours)

UNIT –IV: Groups

Permutation Groups, Counting, Asymmetric Graphs, Orbits on Pairs, Primitivity, Primitivity and Connectivity   (18 Hours)

UNIT –V: Transitive Graphs

Vertex-transitive graphs, Edge-transitive graphs, Edge Connectivity, Vertex Connectivity, Matchings, Hamilton Paths and Cycles, Cayley Graphs, Directed Cayley Graphs with no Hamilton Cycles   (20 Hours)

TEXT BOOKS

1. Topology by K.ChandrasekharaRao, Narosa Publishing House, Reprint 2012.

2. Algebraic Graph Theory (Graduate Texts in Mathematics) by Chris Godsil, Gordon Royle –Springer 2001.

Unit	Text book	Chapter	Sections
I	1	11	11.1 - 11.4
II	1	11,12	11.5, 12.1, 12.2
III	1	12	12.3 -12.5
	2	1	1.5 - 1.7
IV	2	2	2.1 - 2.6
V	2	3	3.1 - 3. 8

REFERENCE BOOKS

1. James Munkres. (2009). Topology, PHI Learning Private limited, 2nd Second edition Reprint 2009.

2. James Dugundji. (2008). Topology, Prentice Hall of India.

3. Norman Biggs. (1993). *Algebraic Graph Theory*, Cambridge University Press, 2nd Edition.

4. Lowell W. Bieneke & Robin J. Wilson. (2006). Topics in Algebraic Graph Theory, Cambridge University Press.

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M.Phil. MATHEMATICS

(2018 -19 onwards)

Semester I	DIFFERENTIAL EQUATIONS AND AUTOMATA THEORY	Hours/Week: 6	
Discipline Specific Elective Course		Credits: 4	
Course Code **18MPMTE12**		Internal 40	External 60

COURSE OUTCOMES

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

- ❖ solve homogeneous second-order equations.

- ❖ understand the concepts of existence and uniqueness of solutions.

- ❖ show an awareness of initial and boundary conditions to obtain particular values of constants in the general solution of second – order differential equations.

- ❖ utilize systems of ODEs and discuss graphical, numerical, and analytical solution methods.

- ❖ transform between equivalent deterministic and non deterministic finite automata, and regular expressions.

- ❖ explain and manipulate the different concepts in automata theory and formal languages such as formal proofs,(non-) deterministic automata, regular expressions, regular languages, context- free grammars, context free languages., TURING MACHINE.

UNIT I: Oscillations of Second Order Equations-Fundamental Results –Sturm's Comparison Theorem – Elementary Linear Oscillations – Comparison Theorem of Hille-Wintner – Oscillations of $x'' + a(t) x = 0$ - Elementary Nonlinear Oscillations.

(18 Hours)

UNIT II: **Boundary Value Problems**

Introduction – Sturm-Liouville Problem – Green's Functions – Non-existence of Solutions – Picard's Theorem.   (18 Hours)

UNIT III :Behaviour of Solutions of Linear Differential Equations

Introduction – n-th order Equations – Elementary Critical Points – Critical Points of Nonlinear Systems – Linear Systems with Constant Coefficients – Linear Systems with Variable Coefficients – Second Order Linear Differential Equations.

(20 Hours)

UNIT IV: Finite Automata and Regular Expressions

Finite state systems – Basic definitions – Nondeterministic finite automata – Finite automata with ε-moves – Regular expressions – Two-way finite automata -- Finite automata with output – Applications of finite automata.   (17 Hours)

UNIT V: Properties of Regular Sets

The pumping lemma for regular sets – Closure properties of regular sets – Decision algorithms for regular sets – The Myhill-Nerode theorem and minimization of finite automata.   (17 Hours)

TEXT BOOKS

1. Deo, S. G. & Raghavendra, V. (1992). *Ordinary Differential Equations and Stability theory*, New Delhi; Tata McGraw-Hill Publishing Company Limited, Fifth Reprint, 1992.

2. John E. Hopcroftn & Jeffery D. Ullman. (2002*). Introduction to Automata Theory, Languages and Computation*, Narosa Publishing House, Indian Student Edition, Nineteenth Reprint 2002.

Unit	Text Book	Chapter	Sections
1	1	6	6.1 - 6.6
2	1	7	7.1 - 7.5
3	1	8	8.1 - 8.7
4	2	2	2.1 - 2.8
5	2	3	3.1 - 3.4

REFERENCE BOOKS

1. Richard Bellman . (1953). *Stability theory of Differential Equations*, McGraw-Hill Book Company, Inc.

2. David.A. Sanchez. (1968). *Ordinary Differential Equations and Stability Theory: An Introduction*, New York: Dover Publications, Inc.

3. Peter Linz. (2010). *An introduction to Formal Languages and Automata,* Narosa Publishing House, 4th Edition, Eighth reprint, 2010.

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(2018 -19 onwards)

Semester II			DISSERTATION & VIVA – VOCE		
Components	**Course code**	**Credit**	**Marks**		
			Int.	**Ext.**	**Total**
Dissertation	18MPMTD21	4	75	75	150
Viva - Voce	18MPMTV21	4	-	50	50
				Total	**200**

COURSE OUTCOMES

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

- develop the ability of the students to prepare a dissertation.

- get clear idea about the new concepts in research level.

Regulations for the Dissertation

❖ Evaluation method for dissertation:

	Max Marks	Credits
Dissertation report	150	4
Viva voce	50	4
Total	200	8

❖ The dissertation must be in the prescribed form. It should be typed neatly in Latex. The font size of the letter should be 11 or12 points.

❖ The format of the dissertation should have the following components.

First page should contain:

Title of the dissertation.

Name of the candidate

Register number.

Name of the supervisor.

Address of the institution

Month & year of submission.

Contents:
- Declaration by candidate

- Certificate by supervisor.

- Acknowledgement

- Preface

- Chapter 1 - Preliminaries.

- Other chapters.

- References.

❖ The number of pages in the dissertation may be minimum of 50.

❖ Each page should contain atleast 20 lines.

❖ Four copies of the dissertation with hard binding should be submitted.

❖ One paper presentation in a Seminar/Conference outside the college is mandatory.

❖ Pre Viva-Voce Presentation in the presence of all faculty members in the Department is compulsory.

❖ Soft copy of the Dissertation is to be checked for plagiarism and certificate issued by the Librarian in this regard is to be attached to the Dissertation on submission.