SADAKATHULLAH APPA COLLEGE

(AUTONOMOUS)

(Reaccredited by NAAC withan 'A' Grade with a CGPA of 3.40 out of 4.00 in the III cycle An ISO 9001:2015 Certified Institution)

RAHMATH NAGAR, TIRUNELVELI- 11,

Tamilnadu

RESEARCH DEPARTMENT OF MATHEMATICS

CBCS SYLLABUS

For

M.Phil. MATHEMATICS

(Applicable for students admitted in June 2018 and onwards)

(As per the Resolutions of the Academic Council Meeting held on 17.10.2018)

M.Phil Syllabus –COURSE STRUCTURE

(Applicable for students admitted in June 2018 and Onwards)

Program Outcomes of M.Phil. in Mathematics:

At the end of the programme, the students will be able to:

- Apply knowledge of Mathematics, in all the fields of learning including higher research and its extensions.
- Apply the concepts of Latex and Matlab in typeset mathematical documentation.

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)
RESEARCH DEPARTMENT OF MATHEMATICS
M.Phil. Mathematics Syllabus
(Applicable for students admitted in June 2018 and onwards)
COURSE STRUCTURE

I SEMESTER				**II SEMESTER**		
COURSE	**H/W**	**C**		**COURSE**	**H/W**	**C**
Core 1	4	4		Project and Viva - Voce	12	12
Core 2	4	4				
Project Oriented Elective Course (Theory)	4	4				
TOTAL	**12**	**12**		**TOTAL**	**12**	**12**

DISTRIBUTION OF HOURS, CREDITS, NO. OF PAPERS, & MARKS

SUBJECT	**HOURS**	**CREDITS**	**NO. OF PAPERS**	**MARKS**
Core	8	8	2	**200**
Project Oriented Elective Course (Theory)	4	4	1	**100**
Project and Viva-voce	12	12	1	**100**
TOTAL	**24**	**24**	**4**	**400**

TITLE OF THE PAPERS
M. PHIL. MATHEMATICS (2018 - 2021)
(The candidate should select any one of the Area Papers in the first semester related to their proposed topics of research)

SEM	**P**	**TITLE OF THE PAPER**	**SUB. CODE**	**H/W**	**C**	**MARKS**		
						I	**E**	**T**
I	DSC1	Research and Educational Methodology	18MCMA11	4	4	25	75	100
	DSC2	Commutative Algebra	18MCMA12	4	4	25	75	100
	DSE	A) Algebraic Graph Theory	18MEMA1A	4	4	25	75	100
		B) Fuzzy Mathematical Concepts	18MEMA1B					
		C) Advanced Graph Theory	18MEMA1C					
		D) Algebraic Topology	18MEMA1D					
II	D	Project and Viva-Voce	18MDMA21	-	12	--	100	100
TOTAL				**12**	**24**	**75**	**325**	**400**

M. Phil. MATHEMATICS SYLLABUS

(Applicable for students admitted in June 2018 and onwards)

I SEMESTER			
DSC 1	**RESEARCH AND EDUCATIONAL METHODOLOGY**		**18MCMA11**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives

- Provide the overview of research methodology.
- Develop their skills in Latex and MATLAB.
- Introduce the required mathematical research foundations of the Banach Algebra.
- Improve their skills in Teaching methodology

UNIT I: Research Methodology:What is Research - Literature Collection - Research Report - Research Report (Formatting and Typing).

UNIT II: LATEX: Drawing with Latex - Presentation Material – Letters- **MATLAB:** Graphics – Basics 2D Plots – Using subplot for Multi Graphs – 3D Plots.

UNIT III: Banach Algebras : Introduction – Complex homomorphism – Basic Propertiesof spectra – Gelfand Mazur Theorem.

UNIT IV: Commutative Banach Algebras: Ideals and homomorphisms – Wiener's lemma – Gelfand transforms - Involutions – Gelfand Naimark Theorem

UNIT V: **Methodology of Teaching**: Teaching – Objectives of Teaching, Phases of Teaching – Teaching Methods: Lecture Method, Discussion Method, Discovery Learning. Inquiry, Problem Solving Method, Project Method, Seminar – Integrating ICT in Teaching: Individualized Instruction, Ways for Effective Presentation with Power Point – Documentation – Evaluation : Formative, Summative and Continuous and Comprehensive Evaluation – Later Adolescent Psychology: Meaning, Physical, Cognitive, Emotional, Social and Moral Development – Teaching Later Adolescents.

TEXT BOOKS:

1. Research Methodology for Biological Sciences by N. Gurumani - MJP Publishers.

UNIT I- Chapters 1,2,4,7

2. Guide to LATEX by Helmut Kopka and Patrick W. Daly, Fourth Edition, Addison – Wesley, Pearson Education, 2004.

UNIT II- Chapters 16, 17, 18

3. Getting Started with MATLAB – A quick introduction for Scientist and Engineers by Rudra Pratap, Oxford University Press 2003.

UNIT II- Chapters 6 (6.1 – 6.3)

4. Functional Analysis (Second Edition) by Walter Rudin- Tata McGraw-Hill Publishing Company Ltd, New Delhi.

UNIT III: Chapter 10 (10.1 to 10.20)

UNIT IV: Chapter 11 (11.1 to 11.20)

References: (For UNIT – V)

1. Sampath.K., Panneerselvam. Aand Santhanam. S., (1984), Introduction to educational technology. (2nd revised). New Delhi: Sterling Publishers.
2. Sharma.S.R.(2003). Effective classroom teaching modern methods, tools and techniques. Jaipur:Mangal Deep.
3. Vedanayagam, E.G. (1989). Teaching technology for college teachers, New York : Sterling Publishers.

Course Learning Outcomes:

- After successful completion of this course, students will be able to understand research methods and typeset mathematical document in Latex and MATLAB
- Possess the basic knowledge about Banach Algebra and Spectral theory
- Acquire detailed knowledge about Teaching Methods, Integrating ICT in Teaching and Ways for Effective Presentation with Power Point, Documentation and Evaluation.

SEMESTER I			
DSC 2	**COMMUTATIVE ALGEBRA**		**18MCMA12**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives:

- Introduce the concept of Nil radical and Jacobson radical and operations on ideals.
- Study different types of modules and Exact Sequences.
- Discuss local properties of rings and modules fractions.
- Establish Noetherian Rings and Artin Rings.

UNIT I: Rings and Ideals: Rings and ring homomorphisms – Ideals Quotient rings – Zero-divisors Nilpotent elements Units – Prime ideals and maximal ideals – Nilradical and Jacobson radical – Operations on ideals – Extension and contraction.

UNIT II: Modules: Modules and module homomorphisms – Submodules and quotient modules – Operations on submodules – Direct sum and product – Finitely generated modules – Exact sequences.

UNIT III: Rings and Modules fractions: Local properties – Extended and contracted ideals in rings of fractions.

UNIT IV: Integral Dependence and Valuations: Integral dependence – The going-up theorem – Integrally closed integral domains. The going-down theorem.

UNIT V: Noetherian Rings: Primary decomposition in Northerian Rings-Artin Rings.

TEXTBOOK:

Introduction to Commutative Algebra by M.FAtiyah and I.G.Macdonald Addison Wesley Publishing Company.

UNIT I - Chapter 1

UNIT II - Chapter 2 Sections: 2.1 – 2.11

UNIT III- Chapter 3

UNIT IV - Chapter 5 Sections: 5.1 – 5.16

UNIT V - Chapters 7 and 8.

Course Learning Outcomes:

- Allocate features to finitely generated modules.
- Access properties implied by different modules on commutative rings.
- Analyze the Noetherian Rings and Artin Rings by giving some examples.

PROJECT ORIENTED ELECTIVE COURSE

I SEMESTER			
DSE A	**ALGEBRAIC GRAPH THEORY**		**18MEMA1A**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives:

- Introduce the concept of Spectrum of a graph and homology of graphs
- Discuss the relation between the spectrum and verterxcolouring
- Study different properties of Automorphism of graphs

UNIT I: Linear Algebra in Graph Theory**:** Spectrum of a Graph – Regular Graphs and line graphs – The homology of graphs.

UNIT II: Spanning Trees and associated Structures – Complexity - Determinant Expansions.

UNIT III: Colouring Problems – Vertex Colouring and the Spectrum – The Chromatic Polynomial - Edge Subgraph Expansion.

UNIT IV: The logarithmic Transformation – The Vertex subgraph Expansion – The Tutte Polynomial – The Chromatic Polynomial and Spanning Trees.

UNIT V: Symmetry and Regularity of Graphs – General Properties of Graph Automorphism – Vertex Transitive Graphs – Symmetric Graphs.

TEXT BOOK:

Algebraic Graph Theory by Norman Biggs – Cambridge University Press 1974.

UNIT I- Sections 2, 3, 4.

UNIT II- Sections 5,6,7.

UNIT III- Sections 8,9,10.

UNIT IV- Sections 11,12,13.

UNIT V- Sections 14,15,16.

Course Learning Outcomes:

- Understand the concept of Spectrumof graphs.
- To develop research level thinking in the field of pure and applied mathematics.
- Keep on discovering new avenues in the chosen field

I SEMESTER			
DSE B	**FUZZY MATHEMATICAL CONCEPTS**		**18MEMA1B**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives:

- Make students acquainted with basic concepts and applications of fuzzy sets theory.
- Study different properties of Fuzzy sets in Algebra and Analysis.
- Applying the concepts of Fuzzy sets in different fields of Mathematics like Graph Theory, Topology and Algebra etc.

UNIT I: Fuzzy subsets-Partially Ordered Sets- Lattices and Boolean Algebras-L-fuzzy sets-Visual Representation of a fuzzy subset-Operations on fuzzy subsets.

UNIT II: Disjunctive Sum- α level set-Properties of fuzzy Subsets of a set-Algebraic Product and sum of two fuzzy subsets-Properties Satisfied by Addition and Product-Cartesian Product of fuzzy Subsets.

UNIT III: Fuzzy Subgroup-Homomorphic and Pre-image of Subgroupoid.

UNIT IV: Fuzzy Subfields and Fuzzy Subspaces-Fuzzy Algebra over Fuzzy Field-Finite Group and Finite Field.

UNIT V: An Over View- Fuzzy Real Numbers- Fuzzy Metric Space.

Text Book:

Fuzzy Mathematical Concepts by S.Nanda, N.R.Das, Narosa Publishing House PVT.LTD.

UNIT I : Chapter 1 : Session: 1.1-1.7

UNIT II : Chapter 1 : Session: 1.8-1.13

UNIT III : Chapter 3 : Session: 3.1,3.2,3.3

UNIT IV : Chapter 4 : Session: 4.1,4.3,4.4

UNIT V : Chapter 8.

Course Learning Outcomes:

- Students acquire necessary knowledge of important parts of fuzzy set theory, which will enable them to create effective mathematical models of technical phenomena.
- Develop research level thinking in the field of applied mathematics.

I SEMESTER			
DSE C	**ADVANCED GRAPH THEORY**		**18MEMA1C**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives

- Develop problem solving skillsin different areas of Graph Theory such as Domination in Graphs.
- Applying the concepts of graph domination at appropriate points of graph theory.
- Motivation to take up research in domination as their career.

UNIT I: Domination in Graphs: Introduction – Terminology and concepts – Applications – Np completeness – History of domination in graphs.

UNIT II: Bounds on the Domination Number: Bounds in terms of order - Bounds in terms of order, degree and packing – Bounds in terms of order and size.

UNIT III: Bounds in terms of degree, diameter and girth – Bounds in terms of independence and covering – Domination, Independence and Irredundance: Hereditary and super hereditary – Independent sets

UNIT IV: Dominating sets – Irredundant sets – The Domination Chain – Extension using maximality and minimality .

UNIT V: Efficiency, Redundancy and Their Duals – Introduction – Efficient Dominating Set - Codes and Cubes

Text Book:

Fundamentals of Domination in graphs by T. W. Haynes, S. T. Hedetniemi and P. J. Slater Marcel Decker.

UNIT I: Chapter 1: Section 1.1 – 1.13
UNIT II: Chapter 2: Section 2.1 – 2.3
UNIT III: Chapter 2: Section 2.4, 2.5 and Chapter 3: Section 3.1, 3.2
UNIT IV: Chapter 3: Section 3.3 – 3.6
UNIT V: Chapter 4: Section 4.1,4.2.

Course Learning Outcomes:

- After completing this course, the student will be able to understand the concepts of domination, Independence and Irredundance.
- Apply the concept of dominations in real time life.
- Study the concepts of Bounds on the Domination Number in terms of degree, diameter and girth.

I SEMESTER			
DSE D	**ALGEBRAIC TOPOLOGY**		**18MEMA1D**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives:

- Introduce the algebraic concepts in Topological spaces and study the basic properties of homotopy of Paths
- Study Separation theorems in the plane such as Jordan Separation theorem and Nulhomotophy lemma.
- Discuss the winding number of a simple closed curve in topological spaces.

UNIT I: The Fundamental Group: Homotopy of Paths – The Fundamental Group – Covering Spaces.

UNIT II: The Fundamental Group of the Circle – Retractions and Fixed Points

UNIT III: Deformation Retracts and Homotopy Type –The fundamental Group of S^n – Fundamental Group of some surfaces.

UNIT IV: Separation Theorems in the plane : The Jordan Separation Theorem – Nulhomotopy lemma – Invariance of Domain

UNIT V: Imbedding Graphs in the Plane – The winding number of a simple closed curve.

TEXT BOOK:

Topology Second Edition by James R. Munkres, PHI Learning Private Limited, Delhi.
UNIT I : Chapter 9 : Section 51 – 53
UNIT II : Chapter 9 : Section 54 – 55
UNIT III : Chapter 9 : Section 58 - 60
UNIT IV : Chapter 10: Sections 61 – 62
UNIT V : Chapter 10 : Sections 64 – 66

Course Learning Outcomes:

- After the successful completion of this course, students will be able to understand the concept of homotopy in topological spaces.
- Student will recall and understand fundamental concepts in Algebra.
- Access properties implied by imbedding graphs in the plane.

II SEMESTER		
D	**DISSERTATION**	**18MDMA21**
Hrs/Week: 12	**Hrs/ Sem : 180**	**Credits: 12**

The following guidelines have to be followed by every candidate while preparing his/her M.Phil. Dissertation:

- The Dissertation should be typed in English.
- The first page, declaration and certificate of the dissertation should be according to the model given at the end of this.
- Dissertation text should be typed in LaTeX with size 12 / 13 on A4 size Executive bond quality paper with double line spacing. Each page should contain at least 20 lines.
- The dissertation should be submitted in duplicate.
- The number of pages in M.Phil. Dissertation should be not less than 80 pages inclusive of bibliography and Annexure.
- Two bound copies of the M.Phil. Dissertation duly signed by the Guide and Head of the Department should be submitted through the Controller of Examinations along with the CD containing the softcopy of the Dissertation in PDF format.
- Candidates shall submit the dissertation to the Controller of Examinations through the Supervisor and Head of the Department within 6 months but not earlier than 5 months from the date of start of the second semester.
- The M.Phil. scholars should attend at least one of the following:
  training programmes / Workshops / Seminars / Symposiums, etc., and that they should also have a paper either published or received for acceptance in an ISSN / Reputed Journal before submitting the Dissertation. M.Phil. Scholars shall present at least one research paper in a conference or seminar as per UGC norms.Photo copy of the publication/Letter of acceptance for publication should be given as Annexure at the end of the Dissertation.**Scholars who fail to comply with the above are not eligible for the submission of their Dissertation**

- Both the Internal as well as External Examiner award 100 marks each for the Dissertation. The distribution of mark will be **60 marks for the Dissertation and 40 marks for the Public Viva-voce Examination**. In the Public Viva-voce Examination the M.Phil. Scholars should present their Dissertation work with PowerPoint Presentation. The Division of marks for the Dissertation is as mentioned below:

Particulars	**Internal Examiner**	**External Examiner**
Wording of Title	5	5
Objectives/ Formulation including Hypothesis	5	5
Review of Literature	10	10
Relevance of Dissertation to Social Needs	5	5
Methodology/ Technique/ Procedure Adopted	15	15
Summary/ Findings/ Conclusion	5	5
Bibliography/ Annexure/ Foot notes	10	10
Training/ Seminar/ Workshop	5	5
	60	**60**

(Model for the Title Page of the Dissertation)

TITLE OF THE DISSERTATION

Dissertation Submitted to the
SadakathullahAppa College (Autonomous)
in partial fulfilment of the requirements for the award of the degree of

MASTER OF PHILOSOPHY (MAJOR)
Submitted by

NAME OF THE CANDIDATE
(REGISTER NO. XXXXXXXX)

Under the guidance of

NAME OF THE GUIDE
Designation of the Guide
SadakathullahAppa College (Autonomous)
Tirunelveli – 627011

RESEARCH DEPARTMENT OF (MAJOR)
SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)
TIRUNELVELI – 627011
MONTH, YEAR

(Model for the Certificate of the Dissertation)

SadakathullahAppa College (Autonomous)

Rahmath Nagar, Tirunelveli – 627011

CERTIFICATE

Certified that the dissertation work with the title, **"TITLE OF THE DISSERTATION"**submitted by **NAME OF THE CANDIDATE** with the register number XXXXXXX in partial fulfilment of the requirements for the award of the degree of **Master of Philosophy in (Major) at the Research Department of (Major),SadakathullahAppa College (Autonomous),** is a work done by the candidate during the period 20XX-XX, under my guidance and supervision and this dissertation or any part thereof has not been submitted elsewhere for any other Degree or Diploma.

Tirunelveli – 627011
DD-MM-YEAR

<<Signature of the HOD with date>>
<<Name of the HOD>>
<<Academic Designation of the HOD>>
<<Name of the Department>>
SadakathullahAppa College (Autonomous)
Tirunelveli - 11

<<Signature of the Supervisor with date>>
<<Name of the Supervisor>>
<<Academic Designation of the Supervisor>>
<<Name of the Department>>
SadakathullahAppa College (Autonomous)
Tirunelveli - 11

Viva-Voce Examination for the candidate was conducted on ……..……

Internal Examiner External Examiner

(Model for the Declaration by the Candidate)

Name of the Candidate,

M.Phil. Scholar, (Register No.: XXXXXXX)
Research Department of XXXXXXXX,
SadakathullahAppa College (Autonomous),
Rahmath Nagar, Tirunelveli – 627011

DECLARATION BY THE CANDIDATE

I hereby declare that, the dissertation with the title, **"TITLE OF THE DISSERTATION"**submitted in partial fulfilment of the requirements for the award of the degree of **Master of Philosophy in XXXXXXXX** at **the Research Department of XXXXXXXX, SadakathullahAppa College (Autonomous)**, is my original work done under the guidance of **Name of the Guide, Designation of the Guide, SadakathullahAppa College (Autonomous), Tirunelveli – 11** and this work has not been submitted elsewhere for any other Degree or Diploma.

Tirunelveli – 627011
DD-MM-YEAR **(Signature of the Candidate)**

Countersigned

1.Signature and Seal of the Guide **2. Signature and Seal of the HOD**