A.D.M COLLEGE FOR WOMEN (AUTONOMOUS),

(Nationally Re-accredited with 'A' Grade by NAAC- 3rd Cycle)

NAGAPATTINAM-611 001

PG & RESEARCH DEPARTMENT OF MATHEMATICS

(for the candidates admitted from the academic year 2021-2024)

M.Phil., MATHEMATICS

SYLLABUS

2021-2022

PG DEPARTMENT OF MATHEMATICS
M.Phil. MATHEMATICS COURSE STRUCTURE UNDER CBCS
(2021-2022 Batch)

OBE ELEMENTS

Programme Educational Objectives (PEO):

PEO 1:	To prepare the students theoretically sound and knowledgable in research activities.
PEO 2:	To develop the students with creative thinking, high integrity and good ethics.
PEO 3:	To inculcate fundamental strength in analyzing and designing new research papers among the students.
PEO 4:	To enable the students to work as a team with multidisciplinary approach.
PEO 5:	To enrich the capability of generating and developing new knowledge for the benefits of mankind.

Programme Outcomes (PO):

On completion of the course the learner will be able

PO 1:	Mathematical Knowledge: Various branches of Mathematics are so selected and designed for M.Phil Mathematics course aiming at mathematical reasoning, sophistication in thing and acquaintance with enough number of subjects including application oriented ones to suit the present needs of various allied branches in Engineering and Science as well as provision of opportunities to pursue research in higher mathematics.
PO 2:	Problem Solving Skills: This programme also offers training in problem solving skills.
PO 3:	Analytical & Logical thinking: The student will be able to develop logical reasoning techniques and Techniques for analyzing the situation.
PO 4:	Learning Number theoretical concepts:Student will learn some important concepts in Number theory that are useful in Cryptography related to the advanced area of research namely Network security.
PO 5:	Understanding Ability: Student will develop ability for generation of mathematical model to a given real life situation as well as learning new areas of mathematics in future either for teaching or for research.

Programme Specific Outcomes (PSO):

On completion of the course the learner will be able

PSO 1:	Connect Mathematics to real life problems in their lives.
PSO 2:	Do intensive research in pure and applied Mathematics.
PSO 3:	Analyze problems of industry and Society.
PSO 4:	Model and provide solutions to scientific and real life situation.
PSO 5:	Prepare for a career in which critical thinking is a central feature.

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M.Phil. Mathematics 2021- 2022 Batch

STRUCTURE OF THE PROGRAMME

Course	No. of Papers	Hours	Credit
Core Course	4	16	16
Elective Course	-	-	-
Project	1	8	8
Total	**20**	**24**	**24**

M.Phil. Mathematics 2021- 2022 Batch

SCHEME OF THE PROGRAMME

Sem.	Course	Course Code	Title of the Paper	Ins. Hrs. / Week	Credit	Exam Hours	Marks		Total Marks
							CIA	SE	
I	Course I	RMM1	Research Methodology	4	4	3	25	75	100
	Course II	RMM2	Algebra and Analysis	4	4	3	25	75	100
	Course III	RMM3	Teaching and Learning Skills (Common Paper)	4	4	3	25	75	100
	Course IV	RMM4	Paper on Research Topic (to be framed by the guide)*	4	4	3	25	75	100
II	Dissertation		Viva / Dissertation: 50 Marks / 150 Marks	8	8	--	--	--	200
Total				**24**	**24**	**-**	**-**	**-**	**600**

Note : * For Course IV the syllabus will be framed by the Guide and the Examination will be conducted by the Controller of Examinations, A.D.M. College for Women (Autonomous), Nagapattinam.

Marks

Maximum - 100 Marks (Passing Minimum 50 Marks)
External - 75 Marks (Passing Minimum 30 Marks)
Internal - 25 Marks (Internal Assessment as per M. Phil Regulations Vide – P.3)

Question Paper Pattern:
Maximum marks: 75
Section A: (10 Questions x 2 marks = 20 marks.) Two Questions from each unit- Answer All
Section B: (5 Questions x 5 marks = 25 marks.) Either or Pattern.
Section C: (3 Questions x 10 marks = 30 marks.) Answer any 3 out of 5 questions.
The following components shall be adopted for continuous internal valuation/assessment

1.	Best 2 tests out of 3	10 marks
2.	Attendance	05 marks
3.	Seminar	05 marks
4.	Assignment	05 marks
	Total	**25 marks**

Semester-I / Core Course I	**Research Methodology**	**Course Code: RMM1**
Instruction Hours: 4	**Credits: 4**	**Exam Hours: 3**
Internal Marks -25	**External Marks-75**	**Total Marks: 100**

Cognitive Level	**K 1 -** Acquire/ Remember **K2 -** Understand **K3** - Apply **K4** - Evaluate **K5** - Analyze **K6** - Create	
Course Objectives	• To understand and apply the fundamental concepts of graphs in dominating sets. • To discuss the concepts of dominating numbers, bounds. • To familiar with the advanced concepts of topology. • To explain the concepts of complex eigen values and multiple eigen values. • To analyze the structure of real world problems and plan solution strategies to solve theproblems using appropriate tools.	
UNIT	**CONTENT**	**HOURS**
I	**Graph Theory:** Dominating sets in Graphs – Sets of Representatives – Applications of Domination Numbers. (Chapter 1 : Sections 1.1 to 1.13)	**12**
II	**Graph Theory:** Bounds on the Domination Number – Bounds in terms of Order, Degree, Packing, Size, Diameter, Girth, Independence and Covering. (Chapter 2 : Sections 2.1 to 2.5)	**12**
III	**Topology:** Homotopy of paths – The Fundamental Group – Covering Spaces – The Fundamental Group of the Circle – Retractions and Fixed Points. (Chapter 9 : Sections 51 -55)	**12**
IV	**Topology:** Deformation Retracts and Homotopy Type – The fundamental Group of S_n - Fundamental Groups of Some Surfaces. (Chapter 9: Sections 58-60)	**12**

V	**Differential Equations:** Uncoupled Linear systems – Diagonalization –Exponentials of operators – Fundamental theorem for Linear systems – Linear Systems in R^2 – Complex eigen values – Multiple Eigen values. (Chapter 1 – 1.1 to 1.7)	**12**

Text Book:

1. Teresa W. Haynes, Stephan T.Hedetniemi, Peter J. Slater, Fundamentals of Domination in Graphs, 1998 – CRC Press
2. James R. Munkres, Topology (2nd Edition),Prentice Hall of India, Pvt. Ltd.,New Delhi, 2004.
3. L. Perko, Differential Equations and Dynamical systems, Springer-Verlag, First Indian Reprint, 2004.

Reference Books

1. R.Balakrishnan and K.Ranganathan , A Text Book of Graph Theory, Springer,2012
2. I.M. Singer and J.A. Thorpe, Lecture Notes on Elementary Topology and Geometry, SpringerVerlag, 2004.
3. E.A Coddington and N. Levinson, Theory of Ordinary differential equations, Tata McGrawHill, New Delhi, 1972.

Web- Resources:

https://www.cusb.ac.in

http://www.wbnsou.ac.in/online_services/SLM/PG/MLIS-07.pdf.

Course Outcomes:

On completion of the course the learner will be able

CO 1: To get a strong background of graph theory concepts.
CO 2: To apply principles and concepts of graph theory in practical situation.
CO 3: To know the definitions of standard terms in topology.
CO 4: To know a variety of examples and counter example.
CO 5: To get a strong knowledge of solving a linear system.

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO						PSO					
	1	2	3	4	5	6	1	2	3	4	5	6
CO1	S	S	S	M	S	S	S	S	M	M	S	S
CO2	S	S	M	S	S	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	M	S	S	S
CO4	S	S	M	S	S	S	S	S	M	S	S	S
CO5	S	S	M	S	S	S	S	S	M	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-I / Core Course II	Algebra and Analysis	Course Code: RMM2
Instruction Hours: 4	Credits: 4	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K 1 -** Acquire/ Remember **K2 -** Understand **K3** - Apply **K4** - Evaluate **K5** - Analyze **K6** - Create
Course Objectives	• To know the definitions and understand the key concepts introduced in this modules. • To have the knowledge of basic properties of primary decompositions, Noetherian Rings and Nakayama's lemma. • To study the topological concepts , Riesz representation theorem , the notion of Lebesgue measure and their properties. • To know the concepts of Inversion theorem and Plancherel theorem. • To study the Riemann mapping theorem.

UNIT	CONTENT	HOURS
I	**Modules:** Basic definitions – Group of homomorphisms – Direct products and sums of modules – Free modules – Vector spaces – The dual space and dual module. (Chapter III: Sections 1 to 6)	12
II	**Noetherian Rings:** Basic criteria – Associated primes – Primary decomposition - Nakayama's lemma. (Chapter X: Sections 1 to 4.)	12
III	**Reisz Representation Theorem:** Topological preliminaries - Riesz representation theorem – Regularity properties of Borel measures –Lebesgue measure – continuity properties of measurable functions. (Chapter 2)	12
IV	**Fourier Transforsms:** Formal properties – Inversion theorem – ThePlancherel theorem – Banach Algebra $L^{1.}$ (Chapter 9)	12

V	**Riemann Mapping Theorem:** Preservation of angles – Linear fractional transformations – Normal families -Riemann Mapping Theorem. (Chapter 14 Pages 278-289)	12

Text Book

1. Serge Lang, "Algebra", Springer - Verlag, Revised Third Edition, 2002.
2. W. Rudin, Real and Complex Analysis, 3rd edition, McGraw Hill International, 1986.

Reference Books

1. C. Musili, Rings and Modules, 2nd edition, Narosa, 1994.
2. P.B. Bhattacharya et al., Basic Abstract Algebra, 2nd edition, Cambridge University Press, 1995.
3. Serge Lang, Complex Analysis, Addison Wesley, 1977.
4. V. Karunakaran, Complex Analysis 2 edn, Narosa, New Delhi, 2005.
5. C.D. Aliprantis and O.Burkinshaw, Principles of Real Analysis 2edn, Academic Press, Inc. New York, 1990.

Web - Resources:

http://newkalviseithi.blogspot.com/2019/08/pg-trb-maths-study-material-hand.html.

https://www.math.stonybrook.edu › b2-alg-inside

Course Outcomes:

On completion of the course the learner will be able

CO1: To familiar with rings and fields and understand the structure theory of modules over a Euclidean domain along with its implications.

CO2:To know the various theorems and their mathematical concepts.

CO3:To have a fundamental understanding of Fourier transforms

CO4:To investigate the concepts of transformations

CO5:To use Riemann mapping theorem in applications.

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO						PSO					
	1	2	3	4	5	6	1	2	3	4	5	6
CO1	S	S	S	M	S	S	S	S	M	M	S	S
CO2	S	S	M	S	S	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	M	S	S	S
CO4	S	S	M	S	S	S	S	S	M	S	S	S
CO5	S	S	M	S	S	S	S	S	M	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-I / Core Course III	**Teaching and Learning Skills**	**Course Code: RMM3**
Instruction Hours: 4	**Credits: 4**	**Exam Hours: 3**
Internal Marks -25	**External Marks-75**	**Total Marks: 100**

Cognitive Level	**K 1 -** Acquire/ Remember **K2 -** Understand **K3** - Apply **K4** - Evaluate **K5** - Analyze **K6** - Create	
Course Objectives	• To acquire knowledge about different parts of computer system and their functions. • To understand the operations and use of computers and common Accessories. • To develop skills of ICT and apply them in teaching learning context and Research. • To acquire the knowledge of communication skill with special reference to its elements,types, development and styles. • To understand the terms communication Technology and Computer mediated teachingand develop multimedia /e- content in their respective subject.	
UNIT	**CONTENT**	**HOURS**
I	**Computer Application Skills:** Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets,Power point slides in the classroom – ICT for Research: On-line journals, e- books, Courseware, Tutorials, Technical reports, Theses and Dissertations-- **ICT for Professional development**: Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology foraction research, etc.	12
II	**Communications Skills:** Communication: Definitions – Elements of Communication: Sender, Message,Channel, Receiver, Feedback and Noise –	12

	Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.	
III	**Pedagogy:** Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.	12
IV	**E- Learning, Technology Integration and Academic Resources in India:** Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning;awareness of e-learning standards- Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, Nationalacademic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.	12
V	**Skills of Teaching and Technology based assessment:** Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- **Technology for**	12

	Assessment: Concept of assessment and paradigm shift in assessment; role of technology inassessment 'for' learning; tools for self & peer assessment (recording devices; erubrics,etc.); online assessment (open source software's; e-portfolio; quizmakers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics.	

Reference Books:

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup andsons, New Delhi
2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/.../note-e-learning.pdf, Retrieved on 05/08/2011
3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd.,Edinburgh
4. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and TomVan Weart, UNESCO, 2002.
5. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in elearning.Innovations in Education & Teaching International, 43(1), 15-27.
6. Kumar, K.L. (2008) Educational Technology, New Age International Publishers,New Delhi.

Web - Resources:

http://egyankosh.ac.in/bitstream/123456789/8511/1/Unit-7.pdf.

http://www.ped.muni.cz/cphpjournal/520132/06.pdf.

Course Outcomes:

On completion of the course the learner will be able

CO1: To understand the operations and use of computers and common Accessories.

CO2:To develop skills of ICT and apply them in teaching learning context and Research.

CO3:To appreciate the role of ICT in teaching, learning and Research.

CO4:To acquire the knowledge of Instructional Technology and its Applications.

CO5:To develop different teaching skills for putting the content across to targeted

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	S	S	S	M	S	S	S	S	M	M	S	S
CO2	S	S	M	S	S	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	M	S	S	S
CO4	S	S	M	S	S	S	S	S	M	S	S	S
CO5	S	S	M	S	S	S	S	S	M	S	S	S

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