



# GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005.

(Reaccredited with A Grade status by NAAC)  
(Affiliated to Bharathidasan University, Tiruchirappalli.)

## PG & RESEARCH DEPARTMENT OF MATHEMATICS

**Programme: M. Phil.    Title: Mathematics    Medium: English**

### Programme Learning Objectives

- To prepare students for successful career in research institutes and various fields.
- To develop the ability among the students to apply mathematical techniques in research.
- To enable the students to work as a team with multidisciplinary approach.
- To provide students with fundamental strength in analyzing, designing and solving research oriented problems.
- To promote and inculcate ethics and code of professional practice among students.

### Programme Outcomes

- After successful completion of Master of Philosophy in Mathematics students will be able to demonstrate basic knowledge in mathematical science.
- The students would acquire basic knowledge of research and skills to design and conduct classes and interpret the results.
- The students will be able to demonstrate understanding of basic knowledge in modern mathematical techniques.
- The students will be able to acquire knowledge to solve real life problems.
- The students will be able to reinforce research skills and high end recent advances in mathematics.
- The students will be able to communicate effectively and demonstrate professional and ethical responsibilities.

### Programme Specific outcomes

PSO1: Improve the issues fathoming abilities.

PSO2: Work together with the other related regions of science.

PSO3: Improve the hypothetical information on Mathematical ideas.

PSO4: Innovatively applying the information on Mathematics in chose genuine circumstances.

**GOVERNMENT ARTS COLLEGE(AUTONOMOUS), KARUR – 639005**

**M.Phil., MATHEMATICS COURSE STRUCTURE UNDER CBCS SYSTEM**

(For the candidates admitted from the year 2012-13 onwards)

SEMESTER	COURSE	SUBJECT TITLE	SUBJECT CODE	INSTR. HOURS WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INT	ESE	
I	Core Course – I	Research Methodology	12MMM1	-	4	3	40	60	100
	Core Course – II	Algebra and Analysis	12MMM2	-	4	3	40	60	100
	Core Course – III	Paper on topic of Research (To be framed by Guide)*	12MMM3A	-	4	3	40	60	100
	Core Course – IV	Teaching and Learning Skills (Common Paper)	12MMM4	-	4	3	40	60	100
II	Dissertation	Viva voce – 50 marks Dissertation – 150 marks	12MMMPW	-	8	--	--	--	200
	TOTAL			-	24				600

Note:\* For Course III the syllabus will be framed by the Guide and the Examination will be conducted by the Controller of Examinations.

Allocation of Marks:

Component	Maximum	Passing Minimum
Internal	40	20
End Semester Examinations	60	30
Project Work – Viva Voce	50	25
Project Work – Dissertation	150	75

Component for Internal:

2 Tests = 2x10 = 20 Marks; Term Paper – 10 Marks; and Seminar – 10 Marks Question

Paper Pattern:

5 Questions – Either or Type – 5x12 = 60 Marks

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**CONTROLLER OF EXAMINATIONS  
BOARD OF STUDIES IN MATHEMATICS**

Sl. No.:

Subject Code:

12MMM1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

**M.Phil., MATHEMATICS – I SEMESTER – CORE COURSE -I**

**(For the candidates admitted from the year 2012-13 onwards)**

**RESEARCH METHODOLOGY**

**Course Outcomes (CO)**

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

1. Be capable of developing thesis statements
2. Get trained to draft their research design
3. Cope up with the mechanics of thesis writing
4. Be competent to produce flawless thesis
5. Enrich knowledge in the field of practical criticism
6. Understand chief critical methods
7. Be critical to validate literary texts

**UNIT – I**

**LOGIC:** Propositions and Logical Operations – Conditional Statements – Methods of Proof – Mathematical Induction.

**UNIT –II**

**MATLAB :** Programming in Matlab – Polynomials, Curve Fitting and Interpolation  
-Applications in Numerical Analysis.

**UNIT –III**

**TOPOLOGY :** Homotopy of paths – The Fundamental Group – Covering Spaces - The Fundamental Group of the Circle – Retractions and Fixed Points.

**UNIT –IV**

**TOPOLOGY :** Deformation Retracts and Homotopy Type – The fundamental Group of  $S^n$   
- Fundamental Groups of Some Surfaces.

**UNIT – V**

**DIFFERENTIAL EQUATIONS:** Uncoupled Linear systems – Diagonalization – Exponentials of operators – Fundamental theorem for Linear systems – Linear Systems in  $\mathbb{R}^2$  – Complex eigen values – Multiple eigen values – Jordan forms – Stability theory – Non-homogeneous linear systems.

**TEXT BOOK(S):**

1. B. Kolman, R.C. Busby and S.C. Ross, Discrete Mathematical Structures, Fourth Indian reprint, Pearson Education Pvt Ltd, New Delhi, 2003. Unit I – Chapter 2.
2. Amos Gilat, MATLAB An Introduction with Applications, John Wiley & Sons, 2004. Unit II – Chapters 7, 8 and 10
3. James R. Munkres, Topology (2nd Edition), Prentice Hall of India, Pvt. Ltd., New Delhi, 2004.  
Unit III - Chapter 9 : Sections 51 -55.. Unit IV - Chapter 9: Sections 58-60
4. L. Perko, Differential Equations and Dynamical systems, Springer-Verlag, First Indian Reprint, 2004. Unit V – Chapter 1 – 1.1 to 1.10

**REFERENCES**

- [1] J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill, New Delhi, 1997.
- [2] I.M. Singer and J.A. Thorpe, Lecture Notes on Elementary Topology and Geometry, Springer Verlag, 2004.
- [3] E.A Coddington and N. Levinson, Theory of Ordinary differential equations , Tata McGraw Hill, New Delhi, 1972.

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12MMM2

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

**M.Phil., MATHEMATICS - I SEMESTER – CORE COURSE - II**

(For the candidates admitted from 2015 – 2016 onwards)

**ALGEBRA AND ANALYSIS**

**Course Outcomes (CO)**

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

1. CO1 Solve problems of simple inequalities.
2. CO2 Simplify the algebraic expression using the commutative and associative and some properties.
3. CO3 Find a rational and irrational number between any two distinct and real numbers.
4. CO4 State the use of Triangle inequality and use of Binomial theorem and mathematical induction to prove inequalities which involve an integer  $n$ .

**UNIT 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)

**UNIT II: NOETHERIAN RINGS:** Basic criteria – Associated primes – Primary decomposition - Nakayama's lemma (Chapter X: Sections 1 to 4)

**UNIT III: REISZ REPRESENTATION THEOREM:** Topological preliminaries - Riesz representation theorem – Regularity properties of Borel measures – Lebesgue measure – continuity properties of measurable functions (Chapter 2 )

**UNIT IV : FOURIER TRANSFORMS:** Formal properties – Inversion theorem – The Plancherel theorem – Banach Algebra L1 (Chapter 9 )

**UNIT V: RIEMANN MAPPING THEOREM:** Preservation of angles – Linear fractional transformations – Normal families - Riemann Mapping Theorem (Chapter 14 Pages 278-289)

**TEXT BOOKS :** Serge Lang, “Algebra”, Springer - Verlag, Revised Third Edition, 2002. W. Rudin, Real and Complex Analysis, 3rd edition, McGraw Hill International, 1986.

**REFERENCES**

- [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.

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Subject Code:

12MMM3A

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

**M.Phil., MATHEMATICS - I SEMESTER – CORE COURSE - III**

(For the candidates admitted from 2015 – 2016 onwards)

**TOPOLOGY AND FUZZY TOPOLOGY**  
**Course Outcomes (CO)**

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

1. CO1 Cite examples and counter examples in Topological and Fuzzy Topological Spaces.
2. CO2 Use proof techniques in Topological and Fuzzy Topological Spaces.
3. CO3 Apply problem solving in Topological and Fuzzy Topological Spaces.
4. CO4 Applications of Topological and Fuzzy Topological Spaces.

Unit: I Topological Spaces: Open Sets and Limit Points – Closed Sets and Closure – Operators and Neighborhoods – Bases and Relative Topologies – Connectedness, Compactness and Continuity: Connected Sets and Components – Compact and Countably Compact Spaces – Continuous Functions – Homeomorphisms.

(Chapter: 3 & 4(except Section 4.5) of [1])

Unit:II Separation and Countability Axioms:  $T_0$ - and  $T_1$ -Spaces –  $T_2$ -Spaces and Sequences – Axioms of Countability – Separability and Summary - Regular and Normal Spaces – Completely Regular Spaces.(Chapter: 5 of [1])

Unit:III Fuzzy Topological Spaces: Introduction – Fuzzy Topology – Intuitionistic Fuzzy Topological Space – Induced Fuzzy Topological Spaces: Introduction – Lower Semi Continuous Function – Induced Fuzzy Topological Space.(Chapter: 4 & 5 of [2])

Unit:IV Connectedness In Fuzzy Topological Space: Introduction – Fuzzy Separated Sets – Fuzzy Connectedness – Some Stronger and Weaker Form of Fuzzy Connectedness – Separation Axioms: Introduction – Fuzzy Separation Axiom – Unification of Fuzzy Separation Axiom.(Chapter: 6 & 7 of [2])

Unit:V Fuzzy Compactness: Introduction – Fuzzy compactness – Various Operators in Fuzzy Topological Space and their Connection.(Chapter: 8 & 9 (Section 9.2 only) of [2])

TEXT BOOK(S):

[1] William J. Pervin, Foundations of General Topology, Academic Press, London, 1970.

[2] Anjan Mukherjee and S. Bhattacharya Halder, Fuzzy set and Fuzzy Topology, Narosa Publishing House, New Delhi, 2015.

REFERENCES:

- R. Vaidyanathaswamy, Set Topology, Chelsea Publishing Company, New York, 1960.
- James R Munkres, Topology, Prentice Hall of India, New Delhi, 2004.
- Timothy J. Ross, Fuzzy Logic With Engineering Applications, Second Edition, John Wiley & Sons Ltd, England, 2004.
- George J. Klir and BO Yuan, Fuzzy Sets and Fuzzy Logic Theory and Applications, Prentice Hall P T R, New Jersey, 1995.
- Guanrong Chen and Trung Tat Pham, Introduction to Fuzzy Sets, Fuzzy Logic, and Fuzzy Control Systems, CRC Press, USA, 2001.

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12MMM3A

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

**M.Phil., MATHEMATICS - I SEMESTER – CORE COURSE - III**

(For the candidates admitted from 2015 – 2016 onwards)

### GENERAL TOPOLOGY

#### Course Outcomes (CO)

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

1. CO1 Demonstrate our understanding of the concepts of metric spaces and topological spaces and their role in mathematics.
2. CO2 Prove basic results about completeness, compactness, connectedness and convergence with in these structures.
3. CO3 Demonstrate are understanding of the concepts of Hilbert spaces and Banach spaces and their role in mathematics.
4. CO4 Demonstrate familiarity with a range of example of these structures.

**UNIT –I** Topological spaces - Bases and subbases – Neighbourhoods (chap 1,2 & 3)

**UNIT –II** Constructs – Filters – Nets (chap 4,5 & 6 )

**UNIT – III** Continuous functions – Constructs Revisited (chap 7 , 8 )

**UNIT- IV** Compact spaces – Connected spaces (chap 9,10 )

**UNIT-V**  $T_0, T_1, T_2$  spaces -  $R_0, R_1$  Regular spaces and  $T_3$  spaces – completely regular and Tychonoff spaces – Normal and  $T_4$  spaces (chap 11,12,14 & 15)

#### TEXTBOOK

Mangesh G. Murdeshwar – General topology, wiley eastern limited, 1986.

#### REFERENCE BOOKS

1. Topology second edition – Jame R.Munkers, PHI learning private limited, 2013.
2. Topology – Dr.K.sundaram, Kedar Nath Ram Nath, 2017
3. Topology (General and Algebraic) – J.N.Sharma & J.P.Chauhan, Krishna Prakashan media private limited, 2016.

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12MMM4

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

**M.Phil., MATHEMATICS – I SEMESTER – CORE COURSE -IV**

**(For the candidates admitted from the year 2012-13 onwards)**

**TEACHING AND LEARNING SKILLS**  
**Course Outcomes (CO)**

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

- CO1 Acquaint different parts of computer system and their functions.
- CO2 Understand the operations and use of computers and common accessories.
- CO3 Develop skills of ICT and apply them in teaching learning context and Research.
- CO4 On the successful completion of the course, the students will be able to appreciate the role of ICT in teaching, learning and Research.
- CO5 Acquire the knowledge of communication skill with special reference to its elements, types, development and styles.
- CO6 Understand the terms communication Technology and Computer mediated teaching and develop multimedia/E-content in their respective subject.
- CO7 understand the communication process through the web acquire the knowledge of instructional.

**Unit I: Computer Applications Skills**

Computer System: Characteristics, Parts and their functions - Different generations of computer – Operation of Computer: switching on/off/restart. Mouse control, Use of key board and some functions of key – 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.

**Unit II: Communication Skills**

Communication Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – 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.

**Unit III: Communication Technology**

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching Multimedia, E – content – Satellite – based communication: EDUSAT and ETV Channels. Communication through web: Audio and Video applications on the internet, interpersonal communication through the web.

**Unit IV: 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 – Modes of teaching: CAI, CMI and WBI

### **Unit V: Teaching Skills**

Teaching Skill: 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.

#### **References:**

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi.
2. Don Skinner (2005), Teaching Training, Edinburgh University Press Ltd, Edinburgh
3. Information and Communication Technology in Education: A Curriculum for schools and programme of Teacher development, Jonathan Anderson and Tom Van Weert, UNESCO, 2002
4. Kumar, KL (2008) Educational Technology, New Age International Publishers, New Delhi
5. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana
6. Michael, D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York
7. Pandey, S.K (2005) Teaching Communication, Commonwealth Publishers, New Delhi
8. Ram Babu, A and Dandapani, S (2006), Microteaching (vol. 1 &2), Neelkammal Publications, Hyderabad
9. Singh V.K. and Sudarshan, K.N. (1996) Computer Education, Discovery Publishing Company, New York
10. Sharma, R.A. (2006) Fundamentals of Educational Technology, Surya Publications, Meerut
11. Vanaja, M. and Rajasekar, S (2006), Computer Education, Neelkamal Publications, Hyderabad.

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