DEPARTMENT OF MATHEMATICS
SCHOOL OF PHYSICAL AND MATHEMATICAL SCIENCES
UNIVERSITY OF KERALA

M.Phil. Programme in Mathematics
Syllabus

(Under Credit and Semester System w.e.f 2016 Admissions)

DEPARTMENT OF MATHEMATICS

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Programme Objectives

- To lay a path towards research
- To strengthen the knowledge of courses
- To bring out innovative ideas in the field of research

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Structure of the Programme

Sem. No	Course Code	Name of the Course	No. of credits
I	MAT 711	Research Methodology	4
	MAT 712	Algebra	4
	MAT 713	Analysis	4
II	MAT 721	Dissertation	20
		TOTAL CREDITS	32

SEMESTER: I
COURSE CODE: MAT-711
COURSE TITLE: Research Methodology
CREDITS: 4

AIM: The main purpose of this course is to help researchers and students of the sciences in our discipline to prepare manuscripts that will have a high probability of being accepted for publication and of being completely understood when they are published.

OBJECTIVES: A scientific experiment, no matter how spectacular results, is not completed until the results are published. Infact, the cornerstone of the philosophy of science is based on the fundamental assumption that original research must be published.

MODULE I : Meaning and Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods verses Methodology, Research and Scientific Method, Research process, Selecting the problem, Necessity of defining the problem, Techniques involved in defining a problem.

MODULE II : Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.

MODULE III : Preparation of the Title, Listing of the Authors and Addresses, Preparation of the Abstract, Writing the Introduction, Writing the Materials and Methods Section, Writing the Results, Writing the Discussion, Stating the Acknowledgements, Citing the References.

MODULE IV : Rights and Permissions, Submission of the Manuscript, The Review Process (How to Deal with Editors), The Publishing Process (How to Deal with Proofs), Writing a Review Paper, Writing Opinion (Book Reviews, Editorials, and Letters to the Editor), Writing a Book Chapter or a Book, Writing for the Public.

MODULE V : Tools and Facilities Available with Computer Technology, Use of Computer Technology in carrying out Specific Research Functions, Use in the Selection of the Research Problem, Use in carrying out Search for the Related Literature, Use in Drawing Samples for the Study, Use in Data Collection, Use in Data Analysis, Use in Quantitative Data Analysis.

References

- Kothari C. R. and Gaurav Garg (2014 – Third Edition), *Research Methodology – Methods and Techniques*, New Age International Publishers.
- Mangal S.K. and Shubhra Mangal (2013), *Research Methodology in Behavioural Sciences*, PHI Learning Private Limited.
- Robert A. Day and Barbara Gastel (Sixth Edition), *How to Write and Publish a Scientific Paper*, Cambridge University Press.

Additional References

- Das. M. N. and Giri. N. (1979) *Design and Analysis of Experiments*, Wiley Eastern Ltd.
- John. W. C. (2009) *Research Design, Qualitative, Quantitative and Mixed Methods Approaches*, Sage Publication.
- Kumar. R. (1996) Research Methodology: *A Step-by-Step Guide for Beginners*, Stage Publication.
- Oliver. P. (2010) *The Student's Guide to Research Ethics*, Open University Press.
- Rohatgi. V. K. (1984) *Statistical Inference*, John Wiley and Sons.
- Rohatgi. V. K. (1993) *An Introduction to Probability Theory and Mathematical Statistics*, Wiley Eastern Ltd.
- Singh. D. and Chaudhary. F.S. (1986) *Theory and Analysis of Sample Survey Designs*, Wiley Eastern Ltd.
- William. M. K. T. (2009) *Research Methods*, Biztantra Publication.
- Zina O'Leary (2010) *The Essential Guide to Doing Your Research Project*, Sage Publication.

SEMESTER: I
COURSE CODE: MAT-712
COURSE TITLE: Algebra
CREDITS: 4
AIM: To motivate the students to do Ph.D work in the field of algebra

OBJECTIVES: To familiarize students with modules generalized inverse of matrices, certain topics in groups, rings and fields, so that they will be able to use it for their research work.

MODULE I: Free Abelian groups, finitely generated Abelian groups, Krull-Smidt theorem, classification of Finite groups, Nilpotent and solvable groups, Normal and subnormal series.

MODULE II: Modules, Homomorphisms and Exact Sequences, Free modules and vector spaces, Projective and Injective modules, Tensor products, Modules over PID.

MODULE III: Field Extension and Fundamental theorem of Galois theory, Splitting fields, Algebraic closure and Normality, Galois groups of polynomials, Finite fields.

MODULE IV: Matrices and Maps, Rank and Equivalence, Determinants, Decomposition of a linear transformation and similarity, The Characteristics polynomial, Eigen vectors and eigen values, Moore-Penrose inverses; application to linear equations.

MODULE V: Simple and primitive rings, The Jacobson Radical, Semisimple rings, division algebra.

Reference

- Hungerford T.W., 2014, Algebra, Springer-Verlag, New York

Additional References

- Artin, 1994, Algebra, Prentice Hall, New Delhi
- Fraleigh J. B., 2005, A First Course in Abstract Algebra, Pearson Education, Delhi
- N. Jacobson, 1991, Basic algebra Vol. I, II, Hindustan Publishing Co., Delhi

SEMESTER: I
COURSE CODE: MAT-713
COURSE TITLE: Analysis
CREDITS: 4
AIM: To motivate the students to do Ph.D work in the field of analysis

OBJECTIVES: To enhance the knowledge of students in some analytical parameters namely measure and integration, L^p spaces, Hilbert spaces and Banach spaces.

MODULE I: The concept of measurability, simple functions, Elementary properties of measure, Integration of positive functions, Integration of complex functions, The Riesz representation Theorem, Regularity properties of Borel measure, Lebesgue measure, Continuity properties of Lebesgue measure.

MODULE II: The L^p - spaces , Approximation by continuous functions, Elementary Hilbert space Theory.

MODULE III: Banach spaces, Baire's theorem and its consequences, Fourier series of continuous functions, The Hahn-Banach Theorem, Total Variation, Absolute Continuity, Radon-Nikodym Theorem, The Hahn Decomposition theorem, Bounded linear functional on L^p, The Riesz Representation Theorem.

MODULE IV: Infinite products, The Weierstrass Factorization Theorem, Jensen's formula, Blaschke products, The Muntz-Szasz Theorem.

MODULE V: Continuation along a curve, The Monodromy Theorem, Construction of a modular function, The Picard Theorem.

Reference

- Walter Rudin, 1989, Real and Complex Analysis (Third Edition) Tata Mc-Graw-Hill Publishing Company Limited, New York

Additional References

- Ahlfors L.V., 1983, Complex Analysis, Mc-Graw Hill Book Co. Inc, New York
- Conway J.B., 1997, Functions of one Complex Variable, Narosa Publishing House, New Delhi
- Limaye B.V., 1997, Functional Analysis, New Age International Publishers, New Delhi
- Royden R.L., 1997, Real Analysis, Prentice Hall, New Delhi

SEMESTER: II
COURSE CODE: MAT-721
COURSE TITLE: DISSERTATION
CREDITS: 20
AIM: To equip and motivate the students to do research and write their thesis.

OBJECTIVES: This course provides a wide knowledge on methodology which helps the students to write a good thesis.