**ALAGAPPA UNIVERSITY, KARAIKUDI**

**NEW SYLLABUS UNDER CBCS PATTERN (w.e.f. 2017-18)**

## M.Phil., MATHEMATICS PROGRAMME STRUCTURE

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sem.** | **Course**  **Code** | **Name of the Course** | **Cr.** | **Max. Marks** | | |
| **Int.** | **Ext.** | **Total** |
| I | 7PMA1C1 | **Core – I** – Research Methodology | 6 | 25 | 75 | 100 |
| 7PMA1C2 | **Core – II** – Functional Analysis | 6 | 25 | 75 | 100 |
| 7PMA1C3 | **Core – III** – General Skills in Geometry | 6 | 75 | 25  (Viva-Voce)/ oral presentation | 100 |
|  | **Total** | | **18** | **--** | **--** | **300** |
| II | 7PMA2C1/  7PMA2C2/  7PMA2C3/  7PMA2C4 | **Core - IV**  (1) Analysis  **(or)**  (2) Domination in Graphs  **(or)**  (3) Algebraic Topology  **(or)**  (4) Distribution Theory | 6 | 25 | 75 | 100 |
| 7PMA2DV | **Core – V-** Dissertation and  Viva – Voce | 12 | 150 Dissertation  50 Viva-voce/ oral presentation | | 200 |
|  | **Total** | | **18** | **--** | **--** | **300** |
|  | **Grand Total** | | **36** | **--** | **--** | **600** |

**M.Phil., MATHEMATICS**

**I YEAR – I SEMESTER**

**COURSE CODE: 7PMA1C1**

**CORE COURSE - I –** **RESEARCH METHODOLOGY**

**Unit I - Types of Research and Report writing**

Types of Research: Exploratory Research, Conclusive Research, Modelling Research, Algorthimic Research. Research Process: Problem Definition, Objectives of the Research, Research Design, Data Collection, Data Analysis, Interpretation of Results, Validation of Results. Report Writing and Presentation: Types of Report, Guidelines for Reviewing Draft, Report format, Typing Instructions and Oral Presentation.

**Unit II – Modules**

Free Modules – Project Modules – Tensor product – Flat Modules.

**Unit III - Localization**

Ideals, Local Rings, Localization.

**Unit IV - The Calculus of variations**

Introduction - Existence of minimizers.

**Unit V - The Calculus of variations**

Regularity, constraints, critical points, problems.

**Text Books**

1. “Research Methodology” R.Panneer Selvam,PHI,New Delhi,(Eleventh Printing) 2013.

Unit I : Sections 1.4 and 1.5 in Chapter I, Chapter 16

1. Commutative Algebra – N. S. Gopalakrishnan (Oxonian Press, New Delhi), Second

Printing 1988.

Unit II : Chapter 1

Unit III: Chapter 2

1. L. C. Evans, Partial Differential Equations, American Mathematical Society,

Providence, 1998.

Unit IV: Chapter 8, Sections 8.1, 8.2

Unit V : Chapter 8, Sections 8.3 - 8.8

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**I YEAR – I SEMESTER**

**COURSE CODE: 7PMA1C2**

**CORE COURSE - II – FUNCTIONAL ANALYSIS**

**Unit I:**

Topological Vector Spaces – Preliminaries, Separation properties, Linear Mappings, Finite dimensional spaces, Metrization.

**Unit II:**

Topological Vector Spaces: Continuation of Metrization - Boundedness and Continuity, Seminorms and Local convexity, Quotient spaces, Examples.

**Unit III:**

Completeness – Baire category theorem, The Banach - Steinhaus theorem, The open mapping theorem, The closed graph theorem, Bilinear mappings.

**Unit IV:**

Convexity – The Hahn-Banach Theorem, Weak topologies, Compact convex sets.

**Unit V:**

Duality in Banach spaces-The normed dual of a normed space, Adjoints, Compact operators.

**Text Book:**

Functional Analysis – Second Edition 2006, Walter Rudin (Tata McGraw – Hill).

Unit I: Sections 1.1 to 1.24 in Chapter I

Unit II: Sections 1.25 to 1.47 in Chapter I

Unit III - Chapter 2 Unit IV: Sections 3.1 to 3.25 in Chapter III

Unit V- Chapter 4

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**I YEAR – I SEMESTER**

**COURSE CODE: 7PMA1C3**

**CORE COURSE - III – GENERAL SKILLS IN GEOMETRY**

**Unit I:**

Algebraic Results – Areas of triangles – Polar coordinates Equation to a locus – Straight line in Rectangular Coordinates – Polar Coordinates and in Oblique Coordinates.

**Unit II:**

Two or more straight lines – Transformation of Coordinates – Systems of circles.

**Unit III:**

Conic sections – The Parabola – The ellipse – The Hyperbola.

**Unit IV:**

Polar equation to a Conic – Tracing of Curves.

**Unit V:**

More general equations, the director circle etc.

**Text Book:**

S.L. Loney - The elements of Coordinate Geometry-Macmillan and Co., New York 1895.

Unit I : Chapter 1 to 5

Unit II : Chapter 6 to 9

Unit III: Chapter 10 to 13

Unit IV: Chapter 14 to 15

Unit V : Chapter 16.

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**I YEAR – II SEMESTER**

**COURSE CODE: 7PMA2C1**

**CORE COURSE –IV (1) – ANALYSIS**

**Unit I:**

Abstract Integration.

**Unit II:**

Positive Borel Measures.

**Unit III:**

LP spaces.

**Unit IV:**

Hilbert space theory.

**Unit V:**

Theory of Banach Algebras.

**Text Book:**

Walter Rudin, Real and Complex Analysis, Tata Mc Graw Hill - Third Edition 2006, New Delhi.

Unit I - Chapter - 1 Unit II - Chapter - 2 Unit III - Chapter - 3 Unit IV - Chapter - 4 Unit V - Chapter - 18

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**I YEAR – II SEMESTER**

**COURSE CODE: 7PMA2C2**

**CORE COURSE IV (2) – DOMINATION IN GRAPHS**

**Unit I:**

Bounds on the Domination Number.

**Unit II:**

Dominations, Independence.

**Unit III:**

Irredunancy, Efficiency.

**Unit IV:**

Conditions on the Dominating Set.

**Unit V:**

Conditions on the Dominating Set (Paired – Domination).

**Books for Reference:**

1. Teresa W. Haynes, Stephen T. H., Hedetniemi and Peter J Slater, “Fundamentals of domination in graphs”, Marcel Deckker, New York, (1998) (Chapters 1, 2, 3, 4 and 6).
2. Teresa W. Haynes, Stephen T. H., Hedetniemi and Peter J Slater, “Advanced topics of domination in graphs”, Marcel Deckker, New York (1998).
3. Gary Chartrand Ping Zhang, “Introduction to graph Theory”, Tata McGraw Hill Edition 2006.

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**I YEAR – II SEMESTER**

**COURSE CODE: 7PMA2C3**

**CORE COURSE IV (3) – ALGEBRAIC TOPOLOGY**

**Unit I:**

The Fundamental Group Homotopy of Paths – The Fundamental Group – Covering Spaces – The Fundamental Group of the Circle – Retraction and Fixed Points.

**Unit II:**

The Fundamental Group The Fundamental Theorem of Algebra – The Borsuk –Ulam Theorem – Deformation Retracts and Homotopy Type – The Fundamental Group of Sn – Fundamental Groups of Some Surfaces.

**Unit III:**

Separation Theorem in the Plane The Jordan Separation Theorem – Invariance of Domain – The Jordan Curve Theorem – Imbedding Graphs in the Plane.

**Unit IV:**

The Seifert –van Kampen Theorem Direct Sums of Abelian Groups – Free Products of Groups – Free Groups – The Seifert – van Kampen Theorem – The Fundamental Group of a Wedge of Circles.

**Unit V:**

Classification of Surfaces Fundamental Groups of Surfaces – Homology of Surfaces – Cutting and Pasting – The Classification Theorem – Constructing Compact Surfaces.

**Text Book:**

J. R. Munkres, Topology, Second Edition, Pearson Education, New Delhi, 2006.

Unit I: Chapter 9 (Sec 51-55)

Unit II: Chapter 9 (Sec 56-60)

Unit III: Chapter 10 (Sec 61-64)

Unit IV: Chapter 11 (Sec 67-71)

Unit V: Chapter 12 (Sec 74-78)

**Books for Reference:**

1. J. Dugundiji, Topology, Allyn and Bacon, Boston, 1966.

2. W.S.Massey,Algebraic Topology-An Introduction,Springer-Verlag,New York,1976

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**I YEAR – II SEMESTER**

**COURSE CODE: 7PMA2C4**

**CORE COURSE IV (4) – DISTRIBUTION THEORY**

**Unit I:** **Test Functions and Distributions:**

Test functions - Distributions - Localization and regularization - Convergence of distributions -Tempered distributions.

**Unit II:** **Derivatives and Integrals:**

Basic Definitions - Examples - Primitives and ordinary differential equations.

**Unit III:** **Convolutions and Fundamental Solutions:**

The direct product of distributions - Convolution of distributions – Fundamental solutions.

**Unit IV:** **The Fourier Transform:**

Fourier transforms of test functions - Fourier transforms of tempered distributions- The fundamental solution for the wave equation-Fourier transform of convolutions-Laplace transforms.

**Unit V:** **Green’s Functions:**

Boundary-Value problems and their adjoints - Green’s functions for boundary-Value problems- Boundary integral methods.

**Textbook:**

An Introduction to Partial Differential Equations by M. Renardy and R.C. Rogers, Second Edition, Springer Verlag, New York, 2008.

Unit I: Section: 5.1

Unit II: Section: 5.2

Unit III: Section: 5.3

Unit IV: Section: 5.4

Unit V: Section: 5.5

**Reference Books:**

1. The Analysis of Linear Partial Differential Operators I – Distribution Theory and Fourier

Analysis by L. HÖrmander, Second Edition, Springer Verlag, Berlin, 2003.

2. Introduction to the Theory of Distributions by F.G. Friedlander and M. Joshi, Cambridge

University Press,UK, 1998.

3. Generalized Functions - Theory and Technique by R.P. Kanwal, Academic Press,

New York, 1983.

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