PRIDE Syllabus

NON-SEMESTER PATTERN

M.Sc. Branch-I : Mathematics

(Candidates admitted from 2007-2008 onwards)

PERIYAR UNIVERSITY, SALEM-11

M.Sc. Degree Course
(Non-Semester Pattern)

Branch-I : MATHEMATICS

FACULTY OF SCIENCE

REGULATIONS AND SYLLABUS

(With effect from 2007-2008 onwards)
1. **Objectives of the Course**

Mathematics to-day is penetrating all fields of human endeavor and therefore it is necessary to prepare the students to cope with the advanced developments in various fields of Mathematics. The objectives of this course are the following:

(a) To import knowledge in advanced concepts and applications in various fields of Mathematics.

(b) To provide wide choice of elective subjects with updated and new areas in various branches of Mathematics to meet the needs of all students.

2. **Eligibility for Admission**

A candidate who has passed B.Sc. Mathematics / B.Sc. Mathematics (Computer Applications) degree of this University or any of the above degree of any other University accepted by the Syndicate as equivalent thereto, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the Master of Science (M.Sc.,) Degree Examination in Mathematics of this University after a course of study of two academic years.

3. **Duration of the Course**

The course of study of Master of Science in Mathematics shall consist of two academic years.

4. **Course of Study**

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Paper</th>
<th>Paper Code</th>
<th>Title of the Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Year</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>I</td>
<td>07PMA01</td>
<td>Algebra</td>
</tr>
<tr>
<td>2</td>
<td>II</td>
<td>07PMA02</td>
<td>Analysis</td>
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<tr>
<td>3</td>
<td>III</td>
<td>07PMA03</td>
<td>Differential Equations</td>
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<tr>
<td>4</td>
<td>IV</td>
<td>07PMA04</td>
<td>General Topology</td>
</tr>
<tr>
<td>5</td>
<td>V</td>
<td>07PMAZ01</td>
<td>Mechanics (or)</td>
</tr>
</tbody>
</table>
5. **Examinations**

The examination shall be of three hours duration for each paper at the end of each year. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

6. **Scheme of Examination**

The scheme of examination shall be as follows:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Paper</th>
<th>Title of the Paper</th>
<th>Duration</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I</td>
<td>Algebra</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>II</td>
<td>Analysis</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>III</td>
<td>Differential Equations</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>IV</td>
<td>General Topology</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>V</td>
<td>Mechanics (or) Fluid Dynamics</td>
<td>3 Hrs</td>
<td>100</td>
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</tbody>
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**First year**

<table>
<thead>
<tr>
<th>II Year</th>
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<tbody>
<tr>
<td>6 VI</td>
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<tr>
<td>7 VII</td>
</tr>
<tr>
<td>8 VIII</td>
</tr>
<tr>
<td>9 IX</td>
</tr>
<tr>
<td>Optional</td>
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<tr>
<td>10 X</td>
</tr>
<tr>
<td>Optional</td>
</tr>
</tbody>
</table>
Second year

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Paper</th>
<th>Title of the Paper</th>
<th>Duration</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>VI</td>
<td>Complex Analysis</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>VII</td>
<td>Mathematical Statistics</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>VIII</td>
<td>Functional Analysis</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>IX</td>
<td>Differential Geometry (or)</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>X</td>
<td>Discrete Mathematics &amp; Graph Theory (or)</td>
<td>3 Hrs</td>
<td>100</td>
</tr>
</tbody>
</table>

7. **Question Paper Pattern**

   Question Paper Pattern

   Time : 3 Hours  Maximum Marks : 100

   **Part – A (5 x 5 = 25 Marks)**

   Answer ALL Questions
   - Two questions from each unit with internal choice.

8. **Passing Minimum**

   The candidate shall be declared to have passed the examination if the candidate secures not less than 50% marks in the University Examination in each paper.

   Candidate who does not obtain the required minimum marks for a pass in a paper shall be required to appear and pass the same at a subsequent appearance.

9. **Classification of Successful Candidates**

   Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in **First Class**.

   All other successful candidates shall be declared to have passed in the **Second Class**.
Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in **First Class with Distinction** provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in the first instance and within a period of two academic years from the year of admission to the course only are eligible for **University Ranking**.

10. **Maximum Duration for the completion of the PG Programme**

The maximum duration for completion of the PG Programme shall not exceed four years.

11. **Commencement of this Regulation**

These regulations shall take effect from the academic year 2007-08 that is, for students who are admitted to the first year of the course during the academic year 2007-08 and thereafter.
PERIYAR UNIVERSITY

Paper-I : 07PMA01

ALGEBRA

Unit-I

Group Theory
Definition of Group – Some examples of Groups – Some Preliminary Lemmas – Subgroups – A Counting principle Normal Subgroups and Quotient groups – Homomorphism – Automorphisms – Cayley’s Theorem – Permutation groups.

Unit-II

Ring Theory
Definition and examples of Rings – Some special classes of rings – Homomorphism – Ideals and Quotient Rings – More ideals and Quotient rings – A particular Euclidean Ring – Polynomial Rings – Polynomial over the rational fields – Polynomial Rings over Commutative Rings.

Unit III

Vector Spaces and Modules
Elementary basic concepts – Linear Independence and bases – Dual Spaces – Inner Product Spaces – Modules.

Unit IV

Fields

Unit V

Canonical Forms

Text Book

Reference Books
PERIYAR UNIVERSITY
Paper-II : 07PMA02
ANALYSIS

Unit-I
Derivation

Functions of Bounded Variations
Introduction – Properties of Monotonic functions – Functions of bounded variations – Total Variation – Addition Property of total Variations – Total Variation on [a, x] as a function of x – Function of bounded variation expressed as the difference of increasing functions – continuous function of bounded variation.

Unit-II
The Riemann Stieltje’s Integral

Unit-III
Sequences of Functions
Unit-IV
Measure Theory

Unit-V
Differentiation and Integration

Text Books
(1) Mathematical Analysis by Tom Apostol
(2) Real Analysis by H.L. Royden

PERIYAR UNIVERSITY
Paper – III : O7PMA03
DIFFERENTIAL EQUATIONS

Unit-I
Linear Equations with Constant Coefficients
Non-homogeneous equations of order two – Homogeneous and non-homogeneous equations of order n – Initial value problem – Annihilater method to solve a non-homogeneous equation.

Chapter 2     Sections 6 to 11

Unit-II
Linear Equations with Variable Coefficients

Chapter 3     Sections 1 to 5

Unit-III
Elliptic Differential Equations
Elliptic Differential equations – Occurrence of Laplace and Poisson equations – Boundary Value Problems –

Chapter 3  Sections 3.1 to 3.9

Unit-IV

Parabolic Differential Equations
Parabolic Differential Equations – Occurrence of the diffusion equation – Boundary conditions – Separation of variable method – Diffusion equation is cylindrical – Spherical coordinates.

Chapter 4  Sections 4.1 to 4.5

Unit-V

Hyperbolic Differential Equations

Chapter 5  Sections 5.1 to 5.6

Text Books

Books for Reference
PERIYAR UNIVERSITY
Paper – IV : 07PMA04
GENERAL TOPOLOGY

Unit-I
Topological Spaces
Topological Spaces – Basis for a Topology – The Order
Topology, the product topology on XxY, the subspace
topology, closed sets and limit points.
Chapter 2   Section 12 to 17

Unit-II
Continuous Functions
Continuous Functions, the product topology, the metric
topology.
Chapter 2   Sections 18 to 21

Unit-III
Connectedness
Connected Spaces, Connected Subspaces of the real line,
Components and Local Connectedness.
Chapter 3   Section 23 to 25

Unit-IV
Compactness
Compact spaces -compact subspace of the real line -limit
point compactness-local compactness.
Chapter 3   Sections 26 to 29

Unit-V
Countability and Separation Axioms
The Countability Axioms - The separation axioms -
Normal spaces -The Urysohn Lemma - The Urysohn
metrization theorem -The Tietze extension theorem.
Chapter 4   Sections 30 to 35

Text Book:
James R. Munkres -Topology, 2nd edition, Prentice Hall of
India Ltd., New Delhi, 2005.

Books for Supplementary Reading and Reference:
(1)  J.Dugundji, Topology, Prentice Hall of India, New
Delhi, 1975.
(2)  G.F.Simmons, Introduction to Topology and
Modern Analysis, McGraw Hill Book Co., New
(3)  S.T.Hu, Elements of General Topology, Holden Day
PERIYAR UNIVERSITY
Paper – V : 07PMAZ01 (Optional)
MECHANICS

Unit - I
Mechanical Systems

Chapter 1 Sections 1.1 to 1.5

Unit - II
Lagrange's Equation
Lagrange's Equation - Derivation of Lagrange's equation - Examples - Integrals of Motion

Chapter 2 Sections 2.1 to 2.3

Unit – III
Hamilton's Equation

Chapter 4 Sections 4.1 to 4.3

Unit - IV
Hamilton - Jacobi Theory

Chapter 5 Sections 5.1 to 5.3

Unit – V
Canonical Transformation
Canonical Transformation - Differential forms and generating functions - Special transformations - Lagrange and Poisson brackets.

Chapter 6: Sections 6.1 to 6.3

Text Book

Books for Supplementary Reading and Reference
PERIYAR UNIVERSITY
Paper – V : 07PMAZ02 (Optional)

FLUID DYNAMICS

Unit-I

Kinematics of Fluids in Motion
Real fluids and ideal fluids - Velocity of a fluid at a point, Stream lines – Path lines – Steady and unsteady flows, velocity potential - The velocity vector - Local and particle rates of changes - Equations of continuity - Examples.

Chapter 2 Sections: 2.1 to 2.8

Unit-II

Equation of Motion of a fluid
Pressure at a point in a fluid at rest - Pressure at a point in a moving fluid - Conditions at a boundary of two invicid immiscible fluids, Euler's equation of motion – Discussion of the case of steady motion under conservative body forces.

Chapter 3 Sections: 3.1 to 3.7

Unit – III

Some three dimensional flows
Introduction - Sources – Sinks and doublets - Images in a rigid infinite plane - Axis symmetric flows - Stokes stream function.

Chapter 4 Sections: 4.1 to 4.3 and 4.5

Unit – IV

Some two dimensional flows
Two dimensional flows - Meaning of two dimensional flow - Use of cylindrical polar co-ordinates - The stream function - complex potential for two dimensional - Irrational incomprehensible flow - complex velocity potential for standard two dimensional flows - Examples.

Chapter 5 Sections: 5.1 to 5.6

Unit – V

Viscous flows
Viscous flows - Stress components in a real fluid – Relation between Cartesian components of stress - Translation motion of fluid elements - The rate of strain quadric and principle stresses - Further properties of the rate of strain quadric - Stress analysis in fluid motion - Relation between stress and rate of strain - The coefficients of viscosity and
Laminar flow - The Navier-Stokes equations of motion of a viscous fluid.

Chapter 8  Sections: 8.1 to 8.9

Text Book

Books for Supplementary Reading and Reference

PERIYAR UNIVERSITY
Paper – VI : 07PMA05
COMPLEX ANALYSIS

Unit-I
Introduction to Complex Plane

Chapter 1  Sections 1.4 to 1.10

Unit – II
Elementary Properties of Analytic Functions
Introduction to the concept of an analytic function, Power Series, Linear fractional Transformations – Exponential and Trigonometric Functions

Chapter 2  Sections 2.1 to 2.4

Unit – III
Conformal Mappings
Definition and properties of Conformal Mappings, Elementary Conformal Mappings, Physical applications of
conformal mappings - Single valued Branches for multi-valued functions.

Chapter 3 Sections 3.1 to 3.4

Unit - IV
Complex Integral Calculus
Basic definition and properties of Complex Integration - Cauchy’s Theorem - General form of Cauchy’s Theorem - Cauchy’s Integral Formula and its applications.

Chapter 4 Sections 4.1 to 4.4

Unit - V
Complex Integral Calculus (Contd.)
Singularities - Calculus of residues - Computation of integrals - Harmonic Functions.

Chapter 4 Sections 4.5 to 4.8

Text Book

PERIYAR UNIVERSITY

Paper – VII : 07PMA06

MATHEMATICAL STATISTICS

Unit - I
Probability

Unit - II
Random Variables and their Probability Distribution
Introduction - Random variables - Probability distribution of a random variable - Discrete and continuous random variables - Function of a random variable.

Unit - III
Moments and Generating Functions
Introduction - Moments of a Distribution Function - Generating functions - Some moment inequalities.
Unit – IV

Multiple Random Variables

Introduction - Multiple random variables - Independent random variables - Functions of several random variables - Covariance, Correlation and Moments - Conditional expectation – Order Statistics and their distributions.

Unit – V

Limit Theorem


Text Book

Unit - IV

Operations on Hilbert Spaces

Self adjoint operator - Normal and Unitary Operators
Projections.

Chapter 10  Sections 57 to 59

Unit - V

Banach Algebras

Banach Algebras - Definition and examples - Regular and simple elements - Topological divisors of zero - Spectrum - The formula for the spectral radius -The radical and semi-Simplicity.

Chapter 12  Sections 64 to 69

Text Book


Books for Supplementary Reading and Reference:


PERIYAR UNIVERSITY

Paper – IX : 07PMAZ03 (Optional)

DIFFERENTIAL GEOMETRY

Unit – I

Theory of Space Curves

Theory of space curves - Representation of space curves - Unique parametric representation of a space curve - Arc-length - Tangent and osculating plane - Principal normal and binomial - Curvature and torsion - Behavior of a curve near one of its points - The curvature and torsion of a curve as the intersection of two surfaces.

Chapter 1  Sections 1.1 to 1.9

Unit – II

Theory of Space Curves (Contd.)

Contact between curves and surfaces - Osculating circle - Osculating sphere - Locus of center of spherical curvature - Tangent surfaces - Involutes and Evolutes - Intrinsic equations of space curves - Fundamental Existence Theorem - Helices.

Chapter I  Sections 1.10 to 1.18
Unit - III

Local Intrinsic properties of Surface

Definition of a Surface - Nature of points on a surface - Representation of a surface - Curves on surface - Tangent plane and surface normal - The general surface of revolution - Helicoids - Metric on a surface - Direction Coefficients on a surface.

Chapter 2 Sections 2.1 to 2.10

Unit - IV

Local Intrinsic properties of surface and Geodesic on a surface

Families of curves - Orthogonal trajectories - Double family of curves - Isometric correspondence - Intrinsic properties - Geodesics and their differential equations - Canonical geodesic equation - Geodesics on surface of revolution.

Chapter 2 Sections 2.11 to 2.15 and
Chapter 3 Sections 3.1 to 3.4

Unit - V

Geodesic on a Surface

Normal property of Geodesics - Differential equations of geodesics using normal property - Existence theorems - Geodesic parallels - Geodesic curvature - Gauss Bonnet

Chapter 3 Sections 3.5 to 3.8 and Sections 3.10 to 3.13

Text Book


Books for Supplementary Reading and Reference

Unit – I
Difference Calculus
Difference operator - Summation - Generating function - Approximate summation.
Chapter 2 Sections 2.1 to 2.3

Unit – II
Linear Difference Equations
First order equations -General results for linear equations.
Chapter 3 Sections 3.1 to 3.2

Unit – III
Linear Difference Equations (Contd.)
Equations with constant coefficients - Equations with variable coefficients -Z -transform.
Chapter 3 Sections 3.3, 3.5 and 3.7

Unit – IV
Stability Theory
Initial value problems for linear systems - Stability of linear systems - Phase plane Analysis for Linear Systems.
Chapter 4 Sections 4.1 to 4.3

Unit – V
Asymptotic Methods
Introduction - Asymptotic Analysis of Sums - Linear equations.
Chapter 5 Sections 5.1 to 5.3

Text Book

Books for Supplementary Reading and Reference
PERIYAR UNIVERSITY

Paper – X : 07PMAZ05 (Optional)

DISCRETE MATHEMATICS AND GRAPH THEORY

Unit - I
Mathematical Logic

Unit – II
Theory of Inference
Validity using truth table - The Predicate Calculus - Predicates - Statement function Variables and Quantities - Inference Theory of predicate calculus - Valid formula and Equivalence.

Unit - III
Lattice and Boolean Algebra

Unit – IV
Graphs and Paths
Graphs and Simple graphs - Graph Isomorphism - Incidency and Adjacency Matrices - Subgraphs - Vertex degree - Paths and connection - Cycles - Application - The Short path problem.

Unit – V
Trees and Connectivity
Trees - Cut edges and bonds - Cut vertices - Cayley's form - Application - Connector Problem - Connectivity - Block - Application - Reliable Communication Networks.

Text Books
(2) Narasing Deo, Graph Theory with applications to Engineering and Computer Science, Practice Hall of India, New Delhi, 2003.
PERIYAR UNIVERSITY
Paper – X : 07PMAZ06 (Optional)
NUMERICAL METHODS

Unit I
Numerical Analysis, System of Equations and Unconstrained Optimization, Steepest descent, Newton’s method, Fixed point elevation and relaxation method, uniform approximation by polynomials, data fitting, Orthogonal polynomials, least square approximation by polynomials.
Chapter 5   Section 5.1 – 5.3
Chapter 6   Section 6.1 – 6.4 of S.D. Cont & C.D. Boor

Unit – II
Chapter 11 Sections 11.1 to 11.9 of Vedamurthy & Iyengar

Unit - III
Euler’s Method, improved Euler’s method, modified Euler's Method – Runge Method Runge -Kutta Method,
Chapter 11: Sections 11.10 to 11.20

Unit IV
Numerical solutions to partial differential equations - Introduction Difference Quotients - Geometrical representation of partial difference quotients - Classifications of partial difference equations - Elliptic equation
Chapter 12   Sections 12.1 to 12.5

Unit - V
Solution of Laplace’s Equation by Liebmann’s interaction process, Poisson equation - its solution - Parabolic equation - Hyperbolic Equation, Solution to partial differential equations by Relaxation method.
Chapter 12   Sections 12.6 to 12.10

Text Books