SYLLABUS FOR

M.SC. MATHEMATICS

( SEMESTER PATTERN )

( For Candidates admitted in the Colleges affiliated to Periyar University from 2017-2018 onwards )
REGULATIONS

1. OBJECTIVES OF THE COURSE

In recent days Mathematics 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 impart 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. COMMENCEMENT OF THIS REGULATION:

These regulations shall take effect from the academic year 2017-2018, that is, for students who are admitted to the first year of the course during the academic year 2017-2018 and thereafter.

3. DEFINITIONS:

Programme: Programme means a course of study leading to the award of the degree in a discipline.

Course: Course refers to the subject offered under the degree Programme.

4. 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 equivalent thereto, subject to such condition as may be prescribed therefore are eligible for admission to M.Sc., Degree Programme and shall be permitted to appear and qualify for the Master of Science (M.Sc.) Degree Examination in Mathematics of this University.

5. DURATION OF THE COURSE:

The course of study of Master of Science in Mathematics shall consist of two academic years divided into four semesters. Each Semester consists of 90 working days.
6. **SYLLABUS:**

The syllabus of the PG degree Programme has been divided into the following courses:

i. Core Courses,

ii. Elective Courses, and

iii. Extra Disciplinary Course (EDC).

i. Core Courses:

The core courses related to the programme concerned including practicals and project work offered under the programme.

ii. Elective Courses:

There are FOUR Elective Courses offered under the programme related to the major or non major but are to be selected by the students.

iii. Extra Disciplinary Course (EDC):

There is an Extra Disciplinary Course offered under the programme related to the nonmajor but are to be selected by the students.

7. **CREDITS:**

Weightage given to each course of study is termed as credit.

8. **CREDIT SYSTEM:**

The weightage of credits are spread over to four different semester during the period of study and the cumulative credit point average shall be awarded based on the credits earned by the students. A total of 92 credits are prescribed for the Post Graduate programme.

9. **COURSE OF STUDY:**

The course of study for the degree shall be in Branch I-Mathematics (under Choice Based Credit System) with internal assessment according to syllabi prescribed from time to time.
## COURSE OF STUDY AND SCHEME OF EXAMINATION

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>Subject Title</th>
<th>Hours</th>
<th>Internal (25%)</th>
<th>External (75%)</th>
<th>Total</th>
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<td>Core V</td>
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<td>7</td>
<td>Core VI</td>
<td>FLUID DYNAMICS</td>
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<td>8</td>
<td>Core VII</td>
<td>COMPLEX ANALYSIS</td>
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(i) List of Elective Courses:

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<tr>
<td>I</td>
<td>Paper I</td>
<td>Numerical Analysis</td>
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<td>Paper II</td>
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<td>Differential Geometry</td>
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<td>Paper II</td>
<td>Programming with C++</td>
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<td>GROUP D</td>
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<td>IV</td>
<td>Paper I</td>
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<td>Paper II</td>
<td>Optimization techniques (T)</td>
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<td>Practical</td>
<td>C++ Programming Lab (P)</td>
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(ii) List of Extra Disciplinary Courses (EDC):

<table>
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<tr>
<th>S. No.</th>
<th>PAPER CODE</th>
<th>PAPER TITLE</th>
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<tbody>
<tr>
<td>1</td>
<td>Paper I</td>
<td>Numerical &amp; Statistical Methods</td>
</tr>
<tr>
<td>2</td>
<td>Paper II</td>
<td>Statistics</td>
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</table>
11. EXAMINATIONS:

The examination shall be of Three Hours duration for each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination. Practical examinations for PG course should be conducted at the end of the even semester only. At the end of fourth semester viva-voce will be conducted on the basis of the Dissertation/ Project report by one internal and one external examiner.

12. QUESTION PAPER PATTERN AND MARKS DISTRIBUTION:

(i) Question Paper Pattern and Marks Distribution for Theory Examination:

**TITLE OF THE PAPER**

Time: Three Hours  Maximum Marks: 75

**Part – A** (10 X 2 = 20 Marks)

Answer ALL Questions

(Two Questions from each unit)

**Part – B** (5 X 5 = 25 Marks)

Answer ALL Questions

(Two Questions from each unit with internal choice)

**Part – C** (3 X 10 = 30 Marks)

Answer any Three questions out of Five questions

(One question from each unit).
(ii) Question Paper Pattern and Marks Distribution for C++ Programming Lab:

**Question Paper Pattern:**

There will be ONE question with or without subsections to be asked for the Practical examination. Every question should be chosen from the question bank prepared by the examiner(s). Every fourth student get a new question i.e. each question may be used for at most three students.

The answer should contain i) Algorithm (A), ii) Flow Chart (F), iii) Program (P), iv) Execution of the Program with correct output (E & OP), and v) viva-voce (V).

**Marks Distribution for C++ Programming Lab:**

Maximum marks: 100

- Internal (CIA) : 40
- External Assessment (EA- Practical Examination) : 60

( Practical Written Exam.: 50 Marks (The split up marks of this total marks 50 is, for A-05, F-05, P-10, E-20 & OP-05 and V-05) and Record:10 Marks).

13. **Dissertation:**

(a) Topic:

The topic of the dissertation shall be assigned to the candidate before the beginning of third semester and a copy of the same should be submitted to the University for Approval.

(b) No. of copies project / dissertation:

The students should prepare Three copies of dissertation and submit the same for the evaluation by Examiners. After evaluation one copy is to be retained in the college library and one copy is to b submitted to the university (COE) and the student can have the rest.

(c) Format to be followed:

The format of the Project / Dissertation to be prepared and submitted by the students in Semester IV is given below:
M.Sc. MATHEMATICS

Format for the preparation of Project work:

i) Title page:

**TITLE OF THE PROJECT / DISSERTATION**

Project / dissertation Submitted in partial fulfillment of the requirement for the award of the Degree of Master of Science in MATHEMATICS (under Choice Base Credit System) to the Periyar University, Periyar Palkalai Nagar, Salem -636 011.

By

(Student's Name )

(Register Number)

Under the Guidance of

(Guide Name and Designation)

(College Logo)

(Name of the Department)

(College Address)

(Month and Year )
ii) **BONAFIDE CERTIFICATE:**

**CERTIFICATE**

This is to certify that the dissertation entitled ...................... submitted in partial fulfillment of the requirement of the award of the Degree of Master of Science in MATHEMATICS (Under Choice Based Credit System) to the Periyar University, Salem is a record of bonafide research work carried out by ...................... under my supervision and guidance and that no part of the dissertation has been submitted for the award of any degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazines.

Date:

Place: ..............................................

Signature of the Guide

Signature of the Head of the Department.
(iii) Acknowledgement:
   (Drafted by the student)

(iv) Table of contents:

**TABLE OF CONTENTS**

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<th>Chapter No.</th>
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<td>Introduction</td>
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<td>2.</td>
<td>Review of Literature</td>
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<td>Summary</td>
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**14. MINIMUM MARKS FOR PASSING:**

i) Theory Papers: The candidate shall be declared to have passed the examination if the candidate secures not less than 50 marks in total (CIA mark + Theory Exam mark) with minimum of 38 marks in the Theory Exam conducted by the University. The Continuous Internal Assessment (CIA) Mark 25 is distributed to four components viz., Tests, Assignment, Seminar and Attendance as 10, 05, 05 and 05 marks, respectively.

ii) Practical paper: A minimum of 50 marks out of 100 marks in the University examination and the record notebook taken together is necessary for a pass. There is no passing minimum for the record notebook. However submission of record notebook is a must.

iii) Project Work/Dissertation and Viva-Voce: A candidate should secure 50% of the marks for pass. The candidate should attend viva-voce examination to secure a pass in that paper.

Candidate who does not obtain the required minimum marks for a pass in a Paper / Practical/ Project/Dissertation shall be declared Re-Appear (RA) and he / she has to appear and pass the same at a subsequent appearance.

**15. 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 candidate 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 the 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.

16. MAXIMUM DURATION FOR THE COMPLETION OF THE PG PROGRAMME:

The maximum duration for completion of the PG Programme shall not exceed Four Years from the year of admission.

17. TRANSITORY PROVISION:

Candidates who were admitted to the PG course of study before 2017-2018 shall be permitted to appear for the examinations under those regulations for a period of three years, that is, up to end inclusive of the examination of April / May 2020. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.
M.Sc. MATHMATICS

SEMESTER - I

CORE I - LINEAR ALGEBRA

UNIT I : Linear Transformation

UNIT II : Algebra of Polynomials
The algebra of polynomials - Lagrange interpolation - Polynomial ideals - The prime factorization of a polynomial - Determinant functions. (Chapter 4: Sections: 4.1 - 4.5, Chapter 5: Sections: 5.1 & 5.2).

UNIT III Determinants
Permutations and the uniqueness of determinants-Classical adjoint of a (square) matrix - Inverse of an invertible matrix using determinants - Characteristic values - Annihilating polynomials. (Chapter 5: Sections: 5.3 & 5.4, Chapter 6: Sections : 6.1 - 6.3).

UNIT IV : Diagonalization
Invariant subspaces - Simultaneous triangulations - Simultaneous diagonalizations - Direct-sum decompositions - Invariant sums - Primary decomposition theorem. (Chapter 6: Sections: 6.4 -6.8).

UNIT V : The Rational and Jordan Forms
Cyclic subspaces and annihilators-Cyclic decompositions and rational form-The Jordan form-Computation of invariant factors.(Chapter 7: Sections 7.1 - 7.4).

TEXT BOOK:

REFERENCE BOOKS:
UNIT I : Differentiation:

UNIT II : Riemann – Stieltjes Integral:

UNIT III : Sequences and Series of Functions:

UNIT IV : Some Special Functions:

UNIT V:
Linear transformations, Differentiation, the contraction principle, the inverse function theorem, the implicit function theorem. (Chapter 9).

TEXT BOOK:

BOOKS FOR REFERENCE:
UNIT I : Mechanical Systems:

The Mechanical System – Generalized co–ordinates – Constraints – Virtual work – Energy and Momentum. (Chapter 1 Sections 1.1 to 1.5).

UNIT II : Lagrange’s Equations:

Lagrange’s Equation – Derivation of Lagrange’s Equations – Examples – Integrals of motion. (Chapter 2 Sections 2.1 to 2.3).

UNIT III : Hamilton’s Equation:

Hamilton’s Equation – Hamiltons Principle – Hamilton’s Equation – Other Variational Principle. (Chapter 4 Sections 4.1 to 4.3).

UNIT IV : Hamilton – Jacobi Theory:


UNIT V : Canonical Transformation:


TEXT BOOK:


BOOKS FOR REFERENCE:


UNIT I: Linear Equations with Constant Coefficients:
Introduction – Second order homogeneous equations – Initial value problem – Linear dependence and independence – A formula for the Wronskian. (Chapter 2: Section 1 to 5).

UNIT II: Linear Equations with Constant Coefficients (Contd.):
Non-homogeneous equations of order two – Homogenous and non-homogeneous equations of order n – Initial value problem – Annihilator method to solve a non-homogeneous equation. (Chapter 2: Section 6 to 11).

UNIT III: Linear Equations with Variable Coefficients:
Initial value problems for homogeneous equations – solutions of homogeneous equations- Wronskian and linear independence – Reduction of the order of homogeneous equation. (Chapter 3: Section 1 to 5).

UNIT IV: Linear Equations with Regular Singular Points:
Linear equation with regular singular points – Euler equation – second order equations with regular singular points – solutions and properties of Legendre and Bessel equation. (Chapter 3: Section 8 & Chapter 4: Section 1 to 4 and 7 and 8).

UNIT V: First Order Equation – Existence and Uniqueness:

TEXT BOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS

SEMESTER - II

CORE V - ALGEBRA

UNIT I:
Another Counting Principle-Sylows Theorem. (Chapter 2: Sections 2.11 & 2.12 in [1]).

UNIT II:
Direct Product - Finite Abelian Groups. (Chapter 2: Sections 2.13 & 2.14 in [1]).

UNIT III:
Modules and homomorphisms-Classical isomorphism theorems-Direct sums and products – Finitely generated and free modules. (Chapter 4: Sections 4.4 and 4.5 in [2])

UNIT IV:
Elements of Galois Theory-Solvability by Radicals-Galois Group over the Rationals. (Chapter 5 Sections 5.6, 5.7 and 5.8 in [1]).

UNIT V:
Finite Fields-Wedderburn’s Theorem on Finite Division Rings - A Theorem of Frobenius. (Chapter 7: Sections 7.1, 7.2, and 7.3 in [1]).

TEXT BOOK:


BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS
SEMESTER - II

CORE VI - FLUID DYNAMICS

UNIT I : Kinematics of Fluids in Motion:
Real fluids and Ideal fluids - Velocity of a fluid at a point –Stream lines and path lines - Steady and Unsteady flows - The Velocity Potential - The Vorticity Vector - Local and Particle Rates of Change - The Equation of Continuity - Worked Examples. (Chapter 2: Sections 2.1 - 2.8).

UNIT II : Equations of Motion of a Fluid:
Pressure at a point in a fluid at rest - Pressure at a point in a moving fluid - Euler’s equations of Motion - Bernoulli’s equation -Worked Examples - Discussion of the case of steady motion under Conservative Body Forces - Some flows involving axial symmetry(examples 1 and 2 only). (Chapters 3: Sections 3.1, 3.2,3.4 - 3.7, 3.9).

UNIT III : Some Three-Dimensional Flows:
Introduction - Sources, Sinks and Doublets-Images in rigid infinite plane - Images in solid spheres – Axis symmetric flows. (Chapter 4: Sections 4.1 - 4.4).

UNIT IV : Some Two-Dimensional Flows:

UNIT V : Viscous Fluid:
Stress components in a real fluid - Relation between Cartesian Components of Stress -Translational motion of fluid element – The Coefficient of Viscosity and Laminar flow - The Navier- Stokes equation of a viscous fluid - Some solvable problems in viscous flow - Steady motion between parallel planes only. (Chapter 8: Sections 8.1 - 8.3, 8.8, 8.9 and 8.10.1).

TEXTBOOK

BOOKS FOR REFERENCE
UNIT I Complex Integration:
Complex Integration – Fundamental Theorems – Line integrals – Rectifiable Arcs-Line Integrals as Arcs – Cauchy’s Theorem for a Rectangle and in a disk – Cauchy’s Integral Formula – Index of point with respect to a closed curve- The Integral formula – Higher order derivatives – Local properties of analytic functions – Taylor’s Theorem – Zeros and Poles – Local mapping - Maximum Principle. (Chapter 4 : Sections 1 to 3).

UNIT II Complex Integration (Contd.):

UNIT III Harmonic Functions and Power Series Expansions:
Harmonic Functions – Definition and basic properties- Mean-Value Property-Poisson’s formula –Schwarz’s Theorem – Reflection Principle- Weierstrass’s theorem-Taylor’s series –Laurent series. (Chapter 4 : Sections 6 and Chapter 5 : Sections 1).

Unit IV Entire functions: Jenson’s formula – Hadamards theorem.

UNIT V Conformal Mapping:
The Riemann Mapping Theorem, Conformal Mapping of Polygons. A closure look at harmonic functions. (Chapter 6 : Sections 1, 2 and 3).

TEXTBOOK

BOOKS FOR REFERENCE
M.Sc. MATHMATICS

SEMESTER - III

CORE VIII - PARTIAL DIFFERENTIAL EQUATIONS

UNIT I Second order Partial Differential Equations:

UNIT II Elliptic Differential Equations:

UNIT III Parabolic Differential Equations:
Parabolic differential equations – Occurrence of the diffusion equation – Boundary condition – Separation of variable method – Diffusion equation in cylindrical – Spherical co-ordinates. (Chapter 4: Sections 4.1 to 4.5).

UNIT IV Hyperbolic Differential Equations:

UNIT V Integral Transform:

TEXTBOOK

BOOKS FOR REFERENCE
M.Sc. MATHEMATICS

SEMESTER - III

CORE IX - 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: sections 12 to 17).

UNIT II : Continuous functions:


UNIT III : Connectedness:

Connected Spaces – Connected Subspaces of the Real line – Components and Local Connectedness. (Chapter 3: Sections 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:


TEXTBOOK :

BOOKS FOR REFERENCE :


M.Sc. MATHMATICS

SEMESTER - III

CORE X - MEASURE THEORY AND INTEGRATION

UNIT I: Lebesgue Measure:

UNIT II: Lebesgue integral:

UNIT III: Differentiation and Integration:
Differentiation and Integration – Differentiation of monotone functions – Functions of bounded variation – Differentiation of an integral – Absolute continuity. (Chapter 5: Sections 1 to 4).

UNIT IV: General Measure and Integration:

UNIT V: Measure and Outer Measure:
Measure and outer measure – outer measure and measurability – The Extension theorem – Product measures. (Chapter 12: Sections 1, 2 and 4).

TEXTBOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS

SEMESTER - III

CORE XI - CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

UNIT I: Variational Problems with Fixed Boundaries:
The concept of variation and its properties – Euler’s equation- Variational problems for Functionals – Functionals dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of Mechanics. (Chapter 1: Sections 1.1 to 1.7 of [1]).

UNIT II: Variational Problems with Moving Boundaries:
Movable boundary for a functional dependent on two functions – one-side variations - Reflection and Refraction of externals - Diffraction of light rays. (Chapter 2: Sections 2.1 to 2.5 of [1]).

UNIT III: Integral Equation:
Introduction – Types of Kernels – Eigen Values and Eigen functions – Connection with differential equation – Solution of an integral equation – Initial value problems – Boundary value problems. (Chapter 1: Section 1.1 to 1.3 and 1.5 to 1.8 of [2]).

UNIT IV: Solution of Fredholm Integral Equation:
Second kind with separable kernel – Orthogonality and reality eigen function – Fredholm Integral equation with separable kernel – Solution of Fredholm integral equation by successive substitution – Successive approximation – Volterra Integral equation – Solution by successive substitution. (Chapter 2: Sections 2.1 to 2.3 and Chapter 4 Sections 4.1 to 4.5 of [2]).

UNIT V: Hilbert – Schmidt Theory:
Complex Hilbert space – Orthogonal system of functions- Gram Schmit orthogonalization process – Hilbert – Schmit theorems – Solutions of Fredholm integral equation of first kind. (Chapter 3: Section 3.1 to 3.4 and 3.8 to 3.9 of [2]).

TEXTBOOKS:
1. A.S Gupta, Calculus of Variations with Application, Prentice Hall of India, New Delhi, 2005. (For Units I and II),
2. Sudir K.Pundir and Rimple Pundir, Integral Equations and Boundary Value Problems, Pragati Prakasam, Meerut, 2005. (For Units III, IV and V)

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS

SEMESTER - IV

CORE XII - FUNCTIONAL ANALYSIS

UNIT I: Banach Spaces:

Banach Spaces – Definition and examples – Continuous linear transformations – Hahn Banach theorem. (Chapter 9: Sections 46 to 48).

UNIT II: Banach Spaces and Hilbert Spaces:

The natural embedding of N in N** - Open mapping theorem – Conjugate of an operator – Hilbert space – Definition and properties. (Chapter 9: Sections 49 to 51, Chapter 10: Sections 52).

UNIT III: Hilbert Spaces:

Orthogonal complements – Orthonormal sets – Conjugate space H* - Adjoint of an operator (Chapter 10: Sections 53 to 56).

UNIT IV: Operations on Hilbert Spaces:

Self adjoint operator – Normal and Unitary operators – Projections. (Chapter 10: Sections 57 to 59).

UNIT V: Banach Algebras:


TEXTBOOKS:


BOOKS FOR REFERENCE:

UNIT I:

UNIT II:
Parameters of the Distribution - Expectation- Moments – The Chebyshev Inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types. (Chapter 3: Sections 3.1 to 3.8).

UNIT III:
Characteristic functions - Properties of characteristic functions – Characteristic functions and moments – semi-invariants – characteristic function of the sum of the independent random variables – Determination of distribution function by the Characteristic function – Characteristic function of multidimensional random vectors – Probability generating functions. (Chapter 4: Sections 4.1 to 4.7).

UNIT IV:
Some probability distributions - One point , two point , Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – normal gamma – Beta – Cauchy and Laplace (continuous) distributions. (Chapter 5: Section 5.1 to 5.10 (Omit Section 5.11).

UNIT V:
TEXTBOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHMATICS

SEMESTER - I

CORE XIV - GRAPH THEORY

UNIT I : Basic Results:

Introduction-Basic Concepts-Subgraphs-Degrees of Vertices - Paths and Connectedness - Automorphism of a Simple Graph. (Chapter 1: Sections 1.1 - 1.6).


UNIT II : Connectivity and Trees:

Connectivity: Introduction-Vertex cut and Edge Cut-Connectivity and Edge Connectivity.(Chapter 3: Sections 3.1- 3.3). Trees: Introduction-Definition, Characterization and Simple Properties-Centers and Centroids- Cutting the Number of Spanning Trees-Cayley’s Formula. (Chapter 4: Sections 4.1- 4.5).

UNIT III : Independent Sets, Matchings and Cycles:


UNIT IV : Graph Colorings:

Introduction-Vertex colorings-Critical Graphs-Edge colorings of Graphs-Kirkman’s Schoolgirl- Problem-Chromatic Polynomials.(Chapter 7: Sections 7.1 ,7.2 ,7.3 (7.2.1 & 7.2.3 only) ,7.6, 7.8, and 7.9).

UNIT V : Planarity:

Introduction- Planar and Nonplanar Graphs –Euler Formula and its Consequences- K5 and K3,3 are Nonplanar Graphs – Dual of a Plane Graph- The Four-Color Theorem and the Heawood Five- Color Theorem-Hamiltonian Plane Graphs-Tait Coloring.(Chapter 8: Sections 8.1 - 8.6,8.8 and 8.9).
TEXT BOOK:

BOOKS FOR REFERENCE:
2. Narasing Deo, Graph Theory with Application to Engineering and Computer Science, Prentice Hall of India, New Delhi, 2003.
ELECTIVE I - PAPER I - NUMERICAL ANALYSIS

UNIT I: Numerical solutions to ordinary differential equation:

UNIT II: Picard and Euler Methods:

UNIT III: Runge – Kutta Method:

UNIT IV: Numerical Solutions to Partial Differential Equations:

UNIT V: Numerical Solutions to Partial Differential Equations (Contd.):
TEXTBOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS

SEMESTER - I

ELECTIVE I - PAPER II - DIFFERENCE EQUATIONS

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:
Initial value problems for linear systems – Stability of linear systems. (Chapter 4 Sections 4.1 to 4.3).

UNIT V:
Asymptotic analysis of sums – Linear equations. (Chapter 5 Sections 5.1 to 5.3).

TEXT BOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHMATICS

SEMESTER - II

ELECTIVE II - PAPER I - DISCRETE MATHEMATICS

UNIT I : The Foundations: Logic and Proofs:

UNIT II : Counting:
The Basics of Counting- The Pigeonhole Principle - Permutations and Combinations - Generalized Permutations and Combinations - Generating Permutations and Combinations. (Chapter 5: Sections 5.1- 5.3, 5.5 and 5.6).

UNIT III : Advanced Counting Techniques:
Applications of Recurrence Relations - Solving Linear Recurrence Relations Generating Functions. (Chapter 6: Sections 6.1, 6.2 and 6.4).

UNIT IV : Boolean Algebra:

UNIT V : Modeling Computation:
Finite-State machines with Output- Finite-State machines with No Output- Turing Machines. (Chapter 12: Sections 12.2, 12.3 and 12.5).

TEXT BOOK:

BOOKS FOR REFERENCE:
ELECTIVE II - PAPER II - COMBINATORIAL MATHEMATICS

UNIT I : Permutations and combinations.

UNIT II : Generating functions.

UNIT III : Recurrence relations.

UNIT IV : Principle of inclusion and exclusion.

UNIT V : Polya’s theory of counting

TEXT BOOK:

BOOKS FOR REFERENCE:


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 – Principle normal and binormal – Curvature and torsion – Behaviour 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 and osculating sphere – Locus of centre of spherical curvature – Tangent surfaces – Involutes and Evolutes – Intrinsic equations of space curves – Fundamental Existence Theorem – Helices. (Chapter 1 : Sections 1.10 to 1.13 and 1.16 to 1.18).

UNIT III : Local Intrinsic properties of surface:

UNIT IV : Local Intrinsic properties of surface and geodesic on a surface:

UNIT V : Geodesic on a surface:

TEXT BOOK:

BOOKS FOR REFERENCE:
ELECTIVE III - PAPER II - PROGRAMMING WITH C++

UNIT I:

UNIT II:

UNIT III: Function in C++:

UNIT IV: Constructors and Destructors:
UNIT V: Files:


TEXT BOOK:


BOOKS FOR REFERENCE:

UNIT I : Divisibility and Congruence:

Divisibility – Primes - Congruences – Solutions of Congruences – Congruences of Degree one. (Chapter 1: Sections 1.1 to 1.3 and Chapter 2: Sections: 2.1 to 2.3).

UNIT II : Congruence:

The function \( \varphi(n) \) – Congruence of higher degree – Prime power moduli – Prime modulus – Congruence’s of degree two, prime modulus – power Residues. (Chapter 2: Sections 2.4 to 2.9).

UNIT III : Quadratic Reciprocity:

Quadratic residues – Quadratic reciprocity – The Jacobi symbol – Greatest Integer function. (Chapter 3: Sections 3.1 to 3.3 and Chapter 4: Section 4.1)

UNIT IV : Some Functions of Number Theory:

Arithmetic functions –The Mobius inverse formula – The multiplication of arithmetic functions. (Chapter 4: Sections 4.2 to 4.4).

UNIT V : Some Diaphantine Equations:

The equation \( ax + by = c \) - Positive solutions -Other linear equations-The equation \( x^2 + y^2 = z^2 \) - The equation \( x^4 + y^4 = z^2 \) Sums of four and five squares – Waring’s problem – Sum of fourth powers – Sum of Two squares. (Chapter 5: Sections 5.1 to 5.10).

TEXT BOOK:


BOOKS FOR REFERENCE:

M.Sc. MATHMATICS

SEMESTER - IV

ELECTIVE IV- PAPER II - OPTIMIZATION TECHNIQUES

UNIT I : Integer linear programming:

Introduction – Illustrative applications integer programming solution algorithms: Branch and Bound (B & B) algorithm – zero – One implicit enumeration algorithm – Cutting plane Algorithm. (Sections 9.1,9.2,9.3.1.,9.3.2,9.3.3).

UNIT II : Deterministic dynamic programming:

Introduction – Recursive nature of computations in DP – Forward and backward recursion – Selected DP applications cargo – Loading model – Work force size model – Equipment replacement model–Investment model–Inventory models. (Sections 10.1,10.2,10.3,10.4.1,10.4.2,10.4.3,10.4.4,10.4.5).

UNIT III : Decision analysis and games:


UNIT IV : Simulation modeling:


UNIT V : Nonlinear programming algorithms:

M.Sc. MATHEMATICS

TEXT BOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHMATICS

SEMESTER - IV

ELECTIVE IV - PRACTICAL - C++ PROGRAMMING LAB

LIST OF PRACTICALS

1. Create two classes DM and DB, which store the value of distances. DM stores distances in meters and centimeters in DB in feet and inches. Write a program that can create the values for the class objects and add object DM with another object DB.

2. Create a class FLOAT that contains on float data member overload all the four arithmetic operators so that operates on the objects of FLOAT.

3. Design a class polar, which describes a part in a plane using polar coordinates radius and angle. A point in polar coordinates is as shown below. Use the overloads + operator to add two objects of polar. Note that we cannot add polar values of two points directly. The requires first the conversion points into rectangular coordinates and finally creating the result into polar coordinates.

   [Where rectangle co-ordinates: x = r*cos(a); y = r* sin(a); Polar co-ordinates: a = atan (x/y) r = Sqrt (x^2 + y^2)]

4. Create a class MAT of size m*m. Define all possible matrix operations for MAT type objects verify the identity. \((A-B)^2+B^2-2*A*B\).

5. Area computation using derived class.

6. Define a class for vector containing scalar values. Apply overloading concepts for vector additions, multiplication of a vector by a scalar quantity, replace the values in a position vector.

7. Integrate a function using Simson’s 1/3 rule.

8. Solve the system of equations using Guass Seidel method.

UNIT I:

UNIT II:

UNIT III:

UNIT IV:
Correlation Coefficient – Rank correlation coefficient of determination – Linear regression – Method of least squares – Fitting of the curve of the form ax+b, ax^2+bx+c, ab'and ax^b – Multiple and partial correlation (3-variable only).

UNIT V:

TEXT BOOKS:

BOOKS FOR REFERENCE:
2. Dr.Kandasamy, Numerical Methods, Sultan Chand, New Delhi.
M.Sc. MATHMATICS
SEMESTER II
EXTRA DISCIPLINARY COURSE (EDC)
EDC - PAPER II - STATISTICS
(Theorems and proof are not expected)

UNIT I:
Collection, classification and tabulation of data, graphical and diagrammatic representation – Bar diagrams, Pie diagram, Histogram, Frequency polygon, frequency curve and Ogives.

UNIT II:
Measures of central tendency – Mean, Median and Mode in series of individual observations, Discrete series, Continuous series (inclusive), More than frequency, Less than frequency, Mid-value and open-end class.

UNIT III:
Measures of dispersion – Range, Quartile deviation, Mean deviation about an average, Standard deviation and co-efficient of variation for individual, discrete and continuous type data.

UNIT IV:
Correlation – Different types of correlation – Positive, Negative, Simple, Partial Multiple, Linear and non-Linear correlation. Methods of correlation – Karl-Pearson’s coefficient of correlation- Spearman’s rank correlations and Concurrent deviation.

UNIT V:
Regression types and method of analysis, Regression line, Regression equations, Deviation taken from arithmetic mean of X and Y, Deviation taken from assumed mean, Partial and multiple regression coefficients – Applications.

TEXT BOOK:

BOOKS FOR REFERENCE: