DEGREE OF MASTER OF SCIENCE
CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR
M.SC. MATHEMATICS
(COMPUTER APPLICATION)
(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 motivate the students to learn the advanced developments in various fields of Mathematics with computer aided techniques. 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 as 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 (CA) of this University.
5. DURATION OF THE COURSE:

The course of study of Master of Science in Mathematics (Computer Application) 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

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.

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(C) - Mathematics (Computer Applications) 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>University Examination</th>
<th>Credits</th>
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<tr>
<td>2</td>
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<td>REAL ANALYSIS</td>
<td>6</td>
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<td>3</td>
<td>Core III</td>
<td>DIFFERENTIAL EQUATIONS</td>
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<tr>
<td>4</td>
<td>Core IV</td>
<td>DISCRETE MATHEMATICS</td>
<td>6</td>
<td>25</td>
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<tr>
<td>5</td>
<td>Core V</td>
<td>MATHEMATICAL SOFTWARES (LATEX AND MATLAB)</td>
<td>6</td>
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**SEMESTER II**

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<tr>
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<td>NUMERICAL ANALYSIS</td>
<td>6</td>
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<td>Core VII</td>
<td>COMPLEX ANALYSIS</td>
<td>6</td>
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<td>8</td>
<td>Core VIII</td>
<td>MATHEMATICAL STATISTICS</td>
<td>6</td>
<td>25</td>
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<tr>
<td>9</td>
<td>Core IX</td>
<td>C++ PROGRAMMING AND DATA STRUCTURE</td>
<td>6</td>
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<tr>
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<td>C++ PROGRAMMING AND DATA STRUCTURE PRACTICALS</td>
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<td>TOPOLOGY</td>
<td>6</td>
<td>25 25</td>
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<td>JAVA PROGRAMMING</td>
<td>6</td>
<td>25 25</td>
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<td>13</td>
<td>Core XIII</td>
<td>OPTIMIZATION TECHNIQUES</td>
<td>6</td>
<td>25 25</td>
<td>75 75</td>
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<tr>
<td>14</td>
<td>Core XIV</td>
<td>GRAPH THEORY</td>
<td>6</td>
<td>25 25</td>
<td>75 75</td>
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<tr>
<td>15</td>
<td>Core XV</td>
<td>MEASURE THEORY AND INTEGRATION</td>
<td>6</td>
<td>25 25</td>
<td>75 75</td>
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**III SEMESTER**

**IV SEMESTER**

| 16    | Core XVI   | FUNCTIONAL ANALYSIS                               | 6     | 25 25                  | 75 75     | 100    | 5      |
| 17    | Core XVII  | DIFFERENTIAL GEOMETRY                             | 6     | 25 25                  | 75 75     | 100    | 4      |
| 18    | Core XVIII | JAVA PROGRAMMING PRACTICAL                        | 6     | 25 25                  | 75 75     | 100    | 4      |
| 19    | Practical II | ELECTIVE                                       | 6     | 25 25                  | 75 75     | 100    | 4      |
| 19    | Elective - I | ELECTIVE (To be Chosen from the given list)     | 6     | 25 25                  | 75 75     | 100    | 4      |
| 20    | Core XIX   | PROJECT                                           | 6     | 25 25                  | - 100     | 100    | 6      |

**TOTAL** -- -- **2000** 92
List of Elective Courses

<table>
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<th>S. No.</th>
<th>PAPER CODE</th>
<th>PAPER TITLE</th>
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<td>1</td>
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<td>Calculus of Variations and Integral Equations</td>
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<tr>
<td>3</td>
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<td>Database Technology</td>
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<tr>
<td>4</td>
<td></td>
<td>Fluid Dynamics</td>
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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 Practical Examination:

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 Practical Examination:

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 be 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:
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 - CA (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 - CA (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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<td>2.</td>
<td>Review of Literature</td>
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<td>Results</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.
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:

UNIT I Differentiation:

UNIT II Riemann – Stieltjes Integral:

UNIT III SEQUENCES AND SERIES OF FUNCTIONS:

UNIT IV Some Special Functions:


TEXT BOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS (CA)

SEMESTER - I

CORE III - DIFFERENTIAL EQUATIONS

UNIT I: General Solution of Homogeneous Equation:

UNIT II: Power Series Solutions:

UNIT III: Existence and Uniqueness:
Linear systems of first order equations – Homogenous equations with constant coefficients – The exact and uniqueness of solutions of initial value problem for first order ordinary differential equation. The method of successive approximations –Picard’s theorem. (Chapter 7: Sections 37-38 ; Chapter 11: Sections 55 and 56).

UNIT IV: First Order Partial Differential Equations:
Partial differential equations of first order in two independent variables – Formulation – Solution – Integral surfaces passing through a curve – Surfaces orthogonal to a given system – Compactibility – Classification of solutions of first order equation – Solutions of non–linear equation – Charpits Method – Jacobi Method. (Chapter 1: Sections 1.1 – 1.9).

UNIT V: Second Order Partial Differential Equations:
M.Sc. MATHEMATICS (CA)

TEXT BOOKS:


2. J.N. Sharma and K. Singh, Partial Differential Equations for Engineers and Scientist, Narosha Publishing House, New Delhi, 2000 (For Units IV and V)

BOOKS FOR REFERENCE:


M.Sc. MATHEMATICS (CA)

SEMESTER - I

CORE IV - 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:
Boolean Functions- Representing Boolean Functions - Logic Gates - Minimization of Circuits. (Chapter 10: Sections 10.1 -10.4)

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:
UNIT I


UNIT II

Displayed Text - Changing font, Centering and indenting, Lists, Generalized lists, Theorem– like declarations, Tabulator stops, Boxes. Tables, Printing literal text, Footnotes and Marginal notes. Drawing pictures with LATEX.

UNIT III

Mathematical Formulas – Mathematical environments, Main elements of math mode, Mathematical symbols, Additional elements, Fine–tuning mathematics.

UNIT IV


UNIT V

TEXT BOOK:

   For Unit I : Chapter 2 : Sections : 2.1-2.7; Chapter 3 : Sections : 3.1-3.6, 4.1-4.7
   Unit II : Chapter 4 : Sections : 4.8-4.10 & 6.1.
   Unit III : Chapter 5: Sections : 5.1-5.5.

2. RUDRA PRATAP, Getting Started with MATLAB-A Quick Introduction for Scientists and Engineers, Oxford University Press, 2003. (For Unit IV and Unit V)

BOOKS FOR REFERENCE:


2. Dolores M. Etter, David C. Kuncicky, Introduction to MATLAB 7, Prentice Hall, 2004
M.Sc. MATHEMATICS (CA)

SEMESTER - II

CORE VI - 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.)

TEXT BOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS (CA)

SEMESTER - II

CORE VII - COMPLEX ANALYSIS

UNIT I : Power series expansions:

Weiestrass’s theorem – The Taylor series – The Laurent’s series, partial fractions –Infinite products – Canonical products. (Chapter 5: Sections 1 and 2.1, 2.2, & 2.3).

UNIT II : Entire functions: Jenson’s formula – Hadamards theorem.


UNIT III : Conformal Mapping:

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

UNIT IV : Elliptic functions :

Simply periodic functions, Representation by exponentials – The Fourier development – Functions of finite order. Doubly periodic functions : The period module – Unimodular transformation the canonical basis – General properties of elliptic functions (Chapter 7: Sections 1 and 2)

UNIT V : The Weiestrass’s theorem :

The Weiestrass’s function – The functions $\zeta(z)$ and $\sigma(z)$. The differential equation – Problems (Chapter 7: Sections 3.1, 3.2 & 3.3)

TEXT BOOK:


BOOKS FOR REFERENCE:

1. J.B.Conway, Functions of one complex variable, Narosa publishing house, New Delhi, 1980

UNIT I : Probability and Random Variables:
Probability – Axioms – Combinatorics, Probability on finite sample spaces – Conditional probability and Baye’s theorem - Independence of events – Random variables – Probability distribution of a random variable – Discrete and Continuous random variables – Function of a random variable. (Chapter 1: Sections 1.3 to 1.6 and Chapter 2: Sections 2.2 to 2.5).

UNIT II : Moments and Generating Functions:
Moments of a distribution function – Generating functions – Some moment inequalities. (Chapter 3: Sections 3.2 to 3.4).

UNIT III : Multiple Random Variables:
Multiple random variables – Independent random variables – Functions of several random variables. (Chapter 4: Sections 4.2 to 4.4).

UNIT IV : Multiple Random Variables (Contd.):
Covariance, Correlation and Moments – Conditional expectation – Some discrete distributions – Some continuous distributions. (Chapter 4: Sections 4.5 and 4.6 and Chapter 5: Sections 5.2 to 5.3).

UNIT V : Limit Theorems:
Modes of convergence – Weak law of large numbers – Strong law of large numbers – Central Limit Theorems. (Chapter 6: Sections 6.2 to 6.4 and 6.6).

TEXT BOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS (CA)

SEMESTER - II

CORE IX - C++ PROGRAMMING AND DATA STRUCTURE

UNIT I


UNIT II Function in C++:


UNIT III Constructors and Destructors:


UNIT IV

UNIT V


TEXT BOOKS:
2. E. Horowitz and Sahani, Fundamentals of Computer Algorithm, CBS Publishers, New Delhi, 1984. (For Units IV, and V)

BOOKS FOR REFERENCE:
1. Arrays
   1.1. Operations on Arrays
   1.2. Linear Search
   1.3. Binary Search

2. Sorting
   2.1. Bubble Sort
   2.2. Selection Sort
   2.3. Insertion Sort
   2.4. Shell Sort
   2.5. Quick Sort
   2.6. Heap Sort

3. Stacks and Queues
   3.1. Operations on Stack
   3.2. Operations on Queue
   3.3. Operations on Priority Queue
   3.4. Operations on Circular Queue

4. Linked Lists
   4.1. Singly Linked List
   4.2. Doubly Linked List
   4.3. Double-ended List

5. Recursion
   5.1. Towers of Honoi
   5.2. Merge Sort

6. Binary Tree Traversal
TEXT BOOKS:

BOOKS FOR REFERENCE:
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:

TEXT BOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS (CA)  
SEMESTER - III  
CORE – XII - JAVA PROGRAMMING

UNIT I  
Java Tokens – Java statements – Constants – Variables – Data types.  
[Chapters 3 and 4].

UNIT II  
Operators – Expressions – Decision making and Branching. [Chapters 5, 6, and 7].

UNIT III  
Classes – Objects – Methods – Arrays – Strings – Vectors – Multiple Inheritance  
[Chapter 8, 9 and 10].

UNIT IV  
Multithreaded Programming – Managing Errors and Exceptions. [Chapters 12 and 13].

UNIT V  
Applet Programming. [Chapter 14].

TEXT BOOK:

BOOKS FOR REFERENCE:

M.Sc. MATHEMATICS (CA)

SEMESTER - III

CORE XIII - 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. (Chapter 9 : 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. (Chapter 10 : 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:

Decision environment – Decision making under certainty (Analytical Hierarchy
approach) Decision making under risk – Expected value criterion – Variations of the
expected value criterion – Decision under uncertainty Game theory – optimal solution
of two – Person Zero – Sum games – Solution of mixed strategy games. (Chapter 14 : Sections 14.1,14.2,114.3.1,14.3.2,14.4,14.5.1,14.5.2).

UNIT IV Simulation modeling:

What is simulation? – Monte Carlo Simulation – Types of Simulation – Elements of
Discrete Event Simulation – Generic definition of events – Sampling from
probability distributions. Methods for gathering statistical observations – Sub
Interval Method – Replication Method – Regenerative (Cycle) method – Simulation
Languages. (Chapter 18 Sections 18.1, 18.2, 18.3, 18.4.1, 18.4.2, 18.5, 18.6,
18.7.1, 18.7.2, 18.7.3, 18.8).

UNIT V Nonlinear programming algorithms:

Unconstrained non linear algorithms – Direct search method – Gradient method
Constrained algorithms: Separable programming – Quadratic programming –
Geometric programming – Stochastic programming – Linear combinations method –
21.2.4, 21.2.5, 21.2.6).
TEXT BOOK:


BOOKS FOR REFERENCE:

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 cuts and Edge Cuts-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- $K^5$ and $K^3,3$ 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.


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:
General Measure and Integration – Measure spaces – Measurable functions – Integration – Signed Measure – The Radon – Nikodym theorem. (Chapter 11: Sections 1, 2, 3, 5 and 6).

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)

TEXT BOOK:

BOOKS FOR REFERENCE:
M.Sc. MATHEMATICS (CA)
SEMESTER - IV
CORE XVI - 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: Section 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:
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 REFERENCE:
2. H.C. Goffman and G.Fedrick, First Course in Functional Analysis, Prentice Hall of
   India, New Delhi 1987.
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:
Section 1. Classes, Objects, Inheritance, Interface

1. Write a program that randomly fills a 3 by 4 array and prints the largest and smallest values in the array.

2. Design a class to represent a bank Account, Include the following members: Data Members:

   Methods:
   1. Name of the Depositor 1. To assign initial values.
   2. Account Number 2. To deposit an amount.
   3. Type of account 3. To withdraw an amount after checking the balance.
   4. Balance 4. To display the name and balance.

Write a Java program for handling 10 customers.

3. Java lacks a complex data type. Write a complex class that represents a single Complex number and includes methods for all the usual operation, i.e. addition, subtraction, multiplication, and division.

4. Create a class called Publication. Create class Tape and class Book from Publication. Describe properties for subclasses. Create an array of publication references to hold combination of books and tapes.

5. Assume that the test results of a batch of students are stored in 3 different classes. Class Student stores the Roll number. Class test stores the marks obtained in two subjects and Class Result contains the total marks. The Class Result can inherit the details of marks and Roll Number of students. The Weightage is stored in a separate interface Sports. Implement the above multiple inheritance problem by using interface.

Section 2. Exception Handling, Multithreading and Packages

6. Write a Java program to handle different types of exceptions using try, catch and finally statements.
7. Write a Java program to implement the behavior of threads.
   a. To create and run threads.
   b. To suspend and stop threads.
   c. To move a thread from one state to another
   d. By assigning a priority for each thread.

8. Create two Threads subclasses, one with a sun() that starts up, captures the handle of
   the second Thread object and then calls wait(). The other class run() should call
   notifyall() for the first Thread after some number of seconds have passed, so that the
   first thread after some seconds have passed, so the first thread after some number of
   seconds have passed, so that the first thread can print out a message.

9. Create a thread to copy the contents of one file to another file. Write a program to
   implement this thread. Create multiple threads within the program to do multiple file
   copies.

10. Create three classes Protection, Derived and SamePackage all in same package. Class
    Protection is a base class for the class Derived and SamePackage is a separate class.
    Class Protection has three variables each of type private, protected and public. Write a
    program that shows the legal protection modes of all the different variables.

Section 3. Applet Programming

11. Write an applet to draw the following shapes:
    a. Cone
    b. Cylinder
    c. Cube
    d. Square inside a circle
    e. Circle inside a square

12. Design applet to display bar chart for the following table, which shows the annual
    turnover of XYZ
    Company during the period 1997 to 2000.
    Year : 1997 1998 1999 2000
    Turnover (in Crore) : 110 150 100 180
13. Creating a Java applet, which finds palindromes in sentences. Your applet will have two input controls; one input will be a text field for entering sentences, the other input will be a text field or scroll bar for selecting the minimum length a palindrome to be shown. Your applet will output the first 10 palindromes it finds in the sentence.

14. Write a program which displays a text message coming down the screen by moving left to right and modify the above program instead of text moving from left to right it moves top to bottom.

15. Create a thread in an applet that draws an image and makes it move along the screen.

Section 4: AWT Forms Design Using Frames

16. Create a frame with two text fields and three buttons (Cut, Copy & Paste). Data entered in the first text field should response, according to the buttons clicked.

17. Create a frame that contains 3 text fields and four buttons for basic arithmetic operations. You have to enter two numbers in first two text fields. On clicking the respective button that answer should be displayed in the last text field.

18. Create a frame with check box group containing Rectangle, Circle, Triangle, Square. If the particular value is true then the corresponding shape should be displayed.

19. Using AWT create a frame, which contains four-text field name, age, sex and qualification lay out using the flow layouted manager. Run the program and give the values of all text fields in the command line. Initially all the values of text field should be blank. On clicking the click button all the text fields should contain the command line inputs.

20. A car company called Maruthi is selling four models of cars. They are shown below:

<table>
<thead>
<tr>
<th>Code</th>
<th>Car</th>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>Maruthi</td>
<td>800</td>
<td>Rs 2.14 Lakhs</td>
</tr>
<tr>
<td>1000</td>
<td>Maruthi</td>
<td>1000</td>
<td>Rs 3.72 Lakhs</td>
</tr>
<tr>
<td>Esteem</td>
<td>Maruthi</td>
<td>Esteem</td>
<td>Rs 3.69 Lakhs</td>
</tr>
<tr>
<td>Zen</td>
<td>Maruthi</td>
<td>Zen</td>
<td>Rs 3.91 Lakhs</td>
</tr>
</tbody>
</table>

Design a frame with 4 buttons called 800, 1000, Esteem, Zen. When we click a button the details of a particular model must appeared in an exclusive background color, text color and font.
Section-5: Networking, Socket and Servlets Programming

21. Practice with client-Servers and IO: Modify Data Server to watch for “Send Text” request read a file from to “Send Data” for the “Send Text” request read a file from disk and send it back to the client. Add a button to Data Client interface that sends the text request when pushed. Display the text returned by the server in the DataClient Text area.

22. Write a Java program to implement client-server communication using Datagram Socket.

23. Write a program to display the address and name of local machine using Factory Methods.

24. Write a java program to implement Cookies using getCookies(), getName() and getValue() methods.

25. Create a server that asks for a password, the opens a file and sends the file over the network connection. Create a client that connects to this server, gives the appropriate password, then captures and saves the file. Test the pair of programs on your machine using the local host (the local loop back IP address 127.0.0.1 produced by calling InetAddress.getByName(null)).

Text and Reference Books:

(As given under the Course XII- JAWA PROGRAMMING -17PMACA11)
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 orthogonlization 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]).
TEXT BOOKS:

[1]. A.S Gupta, Calculus of Variations with Application, Prentice Hall of India, New Delhi, 2005. (For Units I and II).


BOOKS FOR REFERENCE:


M.Sc. MATHEMATICS (CA)

SEMESTER - IV

ELECTIVE I - PAPER II - NUMBER THEORY

UNIT I Divisibility and Congruence:

Divisibility – Primes - Congruence’s – Solutions of Congruence’s – Congruence’s 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 φ(n) – Congruence of higher degree – Prime power moduli – Prime modulus – Congruence 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 Diophantine 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:

UNIT I

UNIT II

UNIT III
SQL – Two types of SQL statements – SQL *Plus: Getting in – Number data type – Character data type – Date data type – Converting from one column type to another – Update, Delete and Alter – Joining two tables together – Formatting the output.

UNIT IV

UNIT V
M.Sc. MATHEMATICS (CA)

TEXT BOOKS:

BOOKS FOR REFERENCE:
1. Essential Oracle 7, Tom Leurs, (PHI).
M.Sc. MATHEMATICS (CA)

SEMESTER - IV

ELECTIVE I - PAPER IV - 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 vorticity 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 – Condition
at a boundary of two invicid immersible 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 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
coordinates – The stream function – Complex potential for two dimensional –Irrational
incompressible 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).
M.Sc. MATHEMATICS (CA)

TEXT BOOK:

BOOKS FOR REFERENCE: