

**SHIVAJI UNIVERSITY,
KOLHAPUR**



Accredited By NAAC with 'A' Grade

CHOICE BASED CREDIT SYSTEM

Syllabus For

M.Sc. Tech. Mathematics Part -II

SEMESTER III AND IV

(Syllabus to be implemented from June, 2019 onwards.)

1) Title of the course: M.Sc. Tech. (Mathematics)

M.Sc. Tech. (Mathematics) program has semester pattern and Choice Based Credit System.

2) Duration: 3 years.

2) Structure of the course

The following table gives the scheme of Examination at M.Sc. Tech. (Mathematics) (Part II) according to the New Syllabus and pattern of Examination.

M. Sc. Tech. (Mathematics) (Part II) (Semester III) (25 credits)

Course Code	Title of course	Instruction hrs/week	Duration of Term end Exam	Marks Term end exam	Marks-(Internal) Continuous Assessment	Credits
MTT 301	Complex Analysis	4	3	80	20	4
MTT 302	ODE	4	3	80	20	4
MTT 303	DAA -I	4	3	80	20	4
MTT 304	Database System	4	3	80	20	4
MTT 305	Object Oriented Programming with C++	4	3	80	20	4
MTT 306	Lab Work III	10	3	100	--	5

M. Sc. Tech. (Mathematics) (Part II) (Semester IV) (25 credits)

Course Code	Title of course	Instruction hrs/week	Duration of Term end Exam	Marks Term end exam	Marks-(Internal) Continuous Assessment	Credits
MTT 401	Real Analysis	4	3	80	20	4
MTT 402	Operations Research	4	3	80	20	4
MTT 403	DAA -II	4	3	80	20	4
MTT 404	PHP with MySQL	4	3	80	20	4
MTT 405	Java Programming	4	3	80	20	4
MTT 406	Lab Work IV	10	3	100	--	5

Open Electives for PG Students:

Semester	Title of course	Instruction hrs/week	Intake Capacity	Eligibility	Marks and Exam	Credits
ODD	ODE	4	15	Science and Technology	As per MTT 302	4
ODD	Object Oriented Programming with C++	4	15	Science and Technology	As per MTT 305	4
EVEN	Operations Research	4	15	Science and Technology	As per MTT 402	4

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Choice Based Credit System)
(Introduced from June 2019 onwards)

Course Code: MTT301

Title of Course: Complex Analysis

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. compute the region of convergence for power series,
2. prove the Cauchy-Riemann equations and apply them to complex functions in order to examine differentiability and analyticity of complex functions,
3. evaluate complex integration along the curve via Cauchy's theorem and integral formula
4. prove the Cauchy residue theorem and apply it to several kinds of real integrals.
5. compute the Taylor series and Laurent series expansions of complex functions and apply it to for checking the nature of singularities and calculating residues,
6. demonstrate accurate and efficient use of complex analysis techniques to solve the problems in physics, engineering and other mathematical contexts

No. of Credits: 4

UNITS

No. of Lectures

UNIT– I:

15 Lectures

Power series, Radius of convergence, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Conformal mappings, Mobius Transformations.

UNIT– II:

15 Lectures

Line integral, Power series representation of analytic functions, zeros of an analytic function, Liouville's Theorem, Fundamental theorem of algebra, maximum modulus theorem.

UNIT– III:

15 Lectures

The index of a closed curve, Cauchy's theorem and integral formula, Morera's Theorem, Counting zeros, open Mapping theorem, Goursat's Theorem, classification of singularities, Laurent series development, Casorati–Weierstrass theorem.

UNIT– IV:

15 Lectures

Residues, residue theorem, evaluation of real integrals, The argument principle, Rouché's theorem, Schwarz's lemma and its application to characterize conformal maps.

Recommended Book:

1. J. B. Conway: Functions of One Complex Variable, 3rd Edition, Narosa Publishing House, 1973.

Reference Books:

1. S. Ponnusamy, Foundations of Complex Analysis, 2nd Edition, Narosa Publishing House, 2015
2. Alfors L. V.: Complex Analysis, McGraw Hill, 1979.
3. S. Ponnusamy, H Silverman, Complex Variables with Applications, Birkhauser Bostan, 2006
4. J. Brown, R.Churchill , Complex Variables and Applications, MacGraw Hill(India). (8th Edition, 2014.

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Choice Based Credit System)
(Introduced from June 2019 onwards)

Course Code: MTT302

Title of Course: Ordinary Differential Equations

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. solve ordinary differential equations with constant coefficients.
2. check linear independence of functions.
3. construct solutions of ordinary differential equations with variable coefficients.
4. calculate power series solutions.
5. identify and classify singularities.
6. generate approximate solutions.

No. of Credits: 4

UNITS

No. of Lectures

Unit – I :

15 Lectures

Linear Equations with constant coefficients: The second order homogeneous equation, Initial value problems for second order equations, Linear dependence and independence, A formula for the Wronskian, The non-homogeneous equations of order two.

Unit - II

15 Lectures

The homogeneous equations of order n, Initial value problems for the nth order equations, The non-homogeneous equation of nth order. Linear Equations with variable coefficients. Initial value problems for the homogeneous equations. Solutions of the homogeneous equations, The Wronskian and linear independence.

Unit - III

15 Lectures

Reduction of the order of a homogeneous equation, The non-homogeneous equations, Sturm Liouville theory, Homogeneous equations with analytic coefficients, The Legendre equations. Linear Equations with regular singular points: The Euler equations, Second order equations with regular singular points.

Unit – IV

15 Lectures

The Bessel equation, Regular singular points at infinity, Existence and uniqueness of solutions (only statement), The method of successive approximations, The Lipschitz condition, Convergence of the successive approximation.

Recommended Books:

1. E. A. Coddington: An introduction to Ordinary Differential Equations, Prentice Hall of India Pvt. Ltd. New Delhi, 1995.

References Books:

1. G.F. Simmons: Differential Equations with Applications and Historical note, McGraw Hill, Inc. New York., 1972.
2. E. Coddington , N. Levinson , Theory of ordinary differential equations, Tata McGraw Hill Company Ltd., New Dehli, 1987.
3. P. Hartman, Ordinary differential equations, Wiley, 1964.
4. E. D. Rainville: Elementary differential equations, The Macmillan company, New York (1964).

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Choice Based Credit System)
(Introduced from June 2019 onwards)

Course Code: MTT303

Title of Course: Design and Analysis of Algorithms-I

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Apply the algorithms and design techniques to solve problems. Students will be able to compare two algorithms in terms of time and space complexity
2. Study and implement different searching and sorting techniques
3. Study and Solve Problem using Dynamic Programming and Greedy Method Algorithms
4. Students learn advanced data structure and basics of graphs traversal problems

Specific Objectives:

A brief note :- (Unit wise equal weightage should be given in question paper)

Theorems and proofs are expected to be prepared from the books in Basic Reading

No. of Credits: 4

UNITS

No. of Lectures

Unit I

15 Lectures

Introduction: Algorithm Specification, Performance Analysis, Mathematical Foundations-Growth functions, Divide and Conquer- General concept, summations, and recurrences-substitution, iteration, and master methods.

Unit II Searching Sorting-

15 Lectures

Searching in Array, quick sort, merge sort, Heap sort, sorting in linear time, median, and order statistics.

Data Structures- Hash Tables, Binary Search Trees, Red-black trees,

Unit III

15 Lectures

Greedy Algorithms-The General Method, Knapsack Problem, Huffman coding, Minimum cost spanning trees, Single source shortest path- Dijkstra's Algorithm

Dynamic Programming- Matrix chain multiplication, Longest common subsequence, optimal polygon triangulation. Single source shortest path- Bellman Ford Algorithms, All-pairs shortest path

Unit IV

15 Lectures

Advance Data Structures-B-trees, Tree traversal, binomial and Fibonacci heap,

Graphs –Elementary Graph Algorithms(BFS, DFS), Topological sort, Maximum flow problems.

Recommended Reading:

a) Basic Reading:-

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Introduction to Algorithms, Prentice Hall of India. Wesley.
2. S. Basse, A. V. Gelder, Computer Algorithms, Introduction to Design & Analysis, Addison Wesley.
3. Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaram, "Fundamentals of Computer Algorithms" - Universities Press, Second Edition.

b) Additional Reading

1. S. Sedgewick, Algorithms, Addison Wesley.

2. M. J. Quinn, Designing Efficient Algorithms for parallel Computers.

M. Sc. Tech Mathematics (Part II) (Semester III)

(Introduced from June 2019 onwards)

Choice Based Credit System

Course code: **MTT – 304**

Title of Paper: Database Systems

Course outcomes: Upon successful completion of this course, the student will be able to --

1. classify database management system concepts and different data models.
2. describe fundamental elements of relational data models and master the basics of SQL.
3. understand the concepts of integrity, security and normalization approach.
4. develop skills for query processing and optimization.
5. identify the basic issues of transaction processing.
6. demonstrate concepts of concurrency control and recovery system.

No. of Credits: 4

UNITS

No. of Lectures

Unit – I

15 Lectures

Introduction to DBMS: Concept and architecture of DBMS, Levels of Abstraction in a DBMS, **The Three Great Data Models:** The Relational Data Model, The Network Data Model, The Hierarchical Data Model, Comparison of the Models Database Design and the E-R Model: **Overview of the design process, E-R Model, E-R diagrams**

Unit – II

15 Lectures

Relational model :Concept , Relational Algebra and Tuple and Domain Calculus.

Introduction to RDBMS: History, Generations and characteristics, difference between DBMS and RDBMS.

Relational database design :Functional dependencies , Normal Forms, join and decomposition

Unit – III

15 Lectures

SQL functions: MAX, MIN SORT, COUNT, AVERAGE, Numeric, String, Date Functions, Type conversion functions.

SQL: Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), Transaction Control (TCL).

Transactions and Concurrency Control: Transaction concept, ACID Properties of transaction, transaction state, concurrent execution , Serializability.

Unit – IV Security & Protection:

15 Lectures

Role of DBA, Backup and Recovery system.

PL/SQL: Overview, structure of block, Basic Statements, cursor, exception handling, subprograms, database triggers.

Text Books/Reference Books:

1. Korth and Silderschutz - "Database systems concepts" (TMH)
2. C.J.Date - "Introduction to database systems" (Narosa)
3. Desai B. - "Introduction to database concepts"(Galgotia)
4. Ulman J.D. - "Principles of database systems" (Galgotia)
5. Oracle installation and user manual
6. Ivan Bayross – SQL and PL/SQL programming (PHI)
7. Database management system - Pearson publication

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Choice Based Credit System)
(Introduced from June 2019 onwards)

Course Code: MTT305

Title of Course: Object Oriented Programming with C++

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. understand the features of C++ supporting object oriented programming
2. compare the procedural and object-oriented paradigm with concepts of streams, classes, functions, data, and object
3. design, implement, test, debug, and document programs in C++
4. implement dynamic memory management techniques using pointers, constructors, destructors
5. classify inheritance with the understanding of early and late binding
6. demonstrate exception handling, generic programming

No. of Credits: 4

UNITS

No. of Lectures

Unit-I

15 Lectures

Introduction to Object Oriented Paradigms: Basic terminology and features. Skeleton of an Object Oriented Program - Creating and Using Classes and members, member Initialization list, member wise assignment, efficiency considerations. Types of constructor, (Default, Parameterized, Copy), Multiple constructors in a class destructors. **Constant objects** and member functions, **Static** data members and functions, **Friend** Function, friend class, non member functions, this pointer, Nested classes

Unit-II

15 Lectures

Operator overloading and user defined conversions – function overloading, operator overloading fundamentals, Restrictions, overloading unary & binary operators, **Inheritance**-defining a class hierarchy, types of inheritance, Base class member access, Base and Derived class constructor, Direct base classes & indirect base classes, Function overriding

Unit-III

15 Lecture

Virtual functions and Polymorphism- early and late binding, virtual table, virtual pointer, pure virtual functions, virtual base class, virtual inheritance, Run Time Type Identification.

Unit-IV

15 Lectures

Generic Programming- overview, Function templates, Class templates, member templates, introduction to Namespace, overview of Standard Template Library **Exception handling**- keywords, basics of c++ exceptions, catching an exception, re-throwing an exception

Recommended Reading :

a) Basic Reading :-

1. Object Oriented Programming with C++ - E Balagurusamy
2. Bjarne Stroustrup - "The C++ programming language"(Addison Wesley)

c) References :-

1. Object Oriented Programming in C++ - R. Subburaj (Vikas Publication)
2. Rambaugh et.al. - "Object Oriented Modeling and Designing"
3. Grady Booch -"Object Orient Analysis and Design with applications"

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Choice Based Credit System)
(Introduced from June 2019 onwards)

Course Code: MTT306

Title of Course: Lab Work III

Specific Objectives: Objectives are to apply theory studied in computer based papers in the semester.

No. of Credits: 5

The programs related to Object Oriented Programming with C++ and database systems

Practical :50 Marks(Internal Examiner).

Project : 50 Marks(External Examiner).

M. Sc. Tech Mathematics (Part II) (Semester IV)
(Introduced from June 2019 onwards)
Choice Based Credit System

Course code: **MTT – 401**

Title of Paper: Real Analysis

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. generalise the concept of length of interval.
2. analyse the properties of Lebesgue measurable sets.
3. demonstrate the measurable functions and their properties.
4. understand the concept of Lebesgue integration of measurable functions.
5. characterize Riemann and Lebesgue integrability.
6. prove completeness of L^p Spaces.

No. of Credits: 4

UNIT

No. of Lectures

UNIT I:

15 Lectures

σ - algebra and Borel sets of real numbers, Lebesgue outer measure, The sigma algebra of Lebesgue measurable sets, Outer and inner approximation of Lebesgue measurable sets, Countable additivity, Continuity and Borel-Cantelli lemma.

UNIT II:

15 Lectures

Non measurable Sets, Lebesgue Measurable Functions: Sums, product and composition of measurable functions, Sequential pointwise limits and simple approximation, Littlewood's three principles.

UNIT III:

15 Lectures

Egoroff's theorem, and Lusin's theorem, Lebesgue integration of a bounded measurable function, Lebesgue integration of a non-negative measurable function, The general Lebesgue integral, Characterization of Riemann and Lebesgue integrability.

UNIT IV:

15 Lectures

Differentiability of Monotone Functions, Lebesgue's theorem, The L^p Spaces: Normed linear spaces, The inequalities of Young, Hölder and Minkowski, The Riesz-Fischer Theorem.

Recommended Books:

1. H. L. Royden, P.M. Fitzpatrick, Real Analysis, Fourth Edition, PHI Learning Pvt. Ltd., New Delhi, 2010

Reference Books:

1. G. de Barra, Measure Theory and Integration, New Age International (P) Ltd., 1981.
2. I. K. Rana, An Introduction to Measure and Integration, Narosa Book Company, 1997.
3. S. K. Berberian, Measure and Integration, McMillan, New York, 1965.
4. P. K. Jain, V. P. Gupta, Lebesgue measure and Integration, Wiley Easter Limited, 1986.
5. P. K. Halmos, Measure Theory, Van Nostrand, 1950.

M. Sc. Tech Mathematics (Part II) (Semester IV)

(Introduced from June 2019 onwards)

Choice Based Credit System

Course code: MTT – 402

Title of Paper: Operations Research

Course outcomes: Upon successful completion of this course, the student will be able to --

1. Recognize convex sets and convex functions.
2. Calculate maximum and minimum value of a function of several variables.
3. Solve LPP by simplex and dual simplex methods.
4. Construct codes, efficiency and redundancy in Encoding
5. Find optimal value of nonlinear objective function subject to constraints.

No. of Credits: 4

UNIT	No. of Lectures
Unit I Convex sets and their properties: Lines and hyper planes, convex sets, Extreme points of convex set, convex combination of vectors, Convex hull, Convex polyhedron, convex cone, simplex and convex function, General formulation of linear programming problem, Matrix form of LP problem, definitions of standard LPP, Fundamental Theorem of linear programming.	15 lectures
Unit- II Simplex method, Computational procedure of simplex method, Artificial variable techniques, two phase simplex method, problem of degeneracy and method to resolve degeneracy. Duality in linear programming, Concept of duality, definition of primal dual problems, General rules for converting any primal into its dual, duality theorems, Primal and dual correspondence, Duality and simplex method.	15 lectures
Unit – III Dual simplex method , Computational procedure of dual simplex method, Integer linear programming, Gomory’s cutting plane method, Branch and Bound method, Information Theory : Communication process, Quantitative measure of information, A binary unit of information, measure of uncertainty of entropy, basic properties of entropy function (H) Joint and conditional entropies, Uniqueness theorem, Chanel capacity, efficiency and redundancy in Encoding, Shannon Fano encoding procedure.	15 lectures
Unit – IV Non linear programming, Classical optimization techniques, unconstrained problems of maximum and minimum, Some important theorems, Constrained problems of Maxima and Minima, Lagrangian method, Sufficient condition for Maxima and Minima of objective function with more than one equality constraints, Kuhn Tucker necessary and sufficient conditions, Solutions of nonlinear programming problems by using Kuhn Tucker conditions	15 lectures

Recommended Books:

1) S.D. Sharma: Operations Research, Kedar Nath Ram Noth and co. 15th edition Reprint 2009

Reference Books:

1. J.K. Sharma : Operations research
2. Kanti Swarup ,P.K.Gupta and Manmohan : Operations research, S.Chand& Co.
3. Hamady Taha : Operations Research :Mac Millan Co.
4. R.K.Gupta : Operations Research Krishna Prakashan Mandir, Meeru
5. G.Hadley : Linear programming, Oxford and IBH Publishing Co. 6. S.I.Gass : Linear Programming, Mc Graw Hill Book Co

M. Sc. Tech Mathematics (Part II) (Semester IV)
(Introduced from June 2019 onwards)
Choice Based Credit System

Course code: MTT – 403

Title of Paper: Design and Analysis of Algorithms II

Course outcomes: Upon successful completion of this course, the student will be able to --

1. Study and understand basics of parallel Algorithms
2. Study and solve String matching, geometric algorithm problem
3. Understand the various techniques related to transformation and modular arithmetic and encryption
4. Study and Summarize concept of Lower Bound, NP Hard and NP Complete Problems

Specific Objectives: -

(i) A brief note: (Unit wise equal weightage should be given in question paper)

Theorems and proofs are expected to be prepared from the books in Basic Readings.

No. of Credits: 4

UNIT	No. of Lectures
Unit I Sorting Networks-Comparison networks, bitonic sort and merge-sort networks. Arithmetic circuits- Combinational circuits, addition, multiplication, and clocked circuits. Parallel Algorithms-CRCW, EREW algorithm, matrix inversion.	15 Lectures
Unit III String Matching-Rabin-Karp, KMP, Boyer-Moore algorithms. Geometric Algorithms-Algorithms for finding convex hull. Closet pair of points. Linear programming Problems.	15 Lectures
Unit II FFT- Polynomial representation, DFT, FFT. Finite Fields, Network Security Algorithms-Number theory Basic Concepts- Euler's Theorem, Miller Rabin Algorithm, Modular arithmetic. Chinese remainder theorem, RSA Codes, Diffie- Hellman Key Exchange Algorithm	15 Lectures
Unit IV NP- completeness –P and NP classes, NP-completeness and reducibility, NP completeness proofs. Approximation Algorithms-Vertex cover, travelling salesman, set covering, and subset-sum problems.	15 Lectures

(vi) Recommended Reading:

a) Basic Reading:-

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Introduction to Algorithms, Prentice Hall of India. Wesley.
2. S. Basse, A. V. Gelder, Computer Algorithms, Introduction to Design & Analysis, Addison Wesley.
3. Williams Stallings "Cryptography and Network security Principles and Practices" (Pearson Education).

b) Additional Reading: S. Sedgewick, Algorithms, Addison Wesley.

c) References :-

i) Books :-

1. M. J. Quinn, Designing Efficient Algorithms for parallel Computers.
2. C. E. Leiserson.
3. R. L. Rivesl prentice Hall of India.

ii) Periodicals/Journals:

NOTE :

i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 Hr per week for problem solving/tutorial/seminar**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary) **NIL**

M. Sc. Tech Mathematics (Part II) (Semester IV)
(Introduced from June 2019 onwards)
Choice Based Credit System

Course code: **MTT – 404**

Title of Paper: PHP with MySQL

Course outcomes: Upon successful completion of this course, the student will be able to --

1. Students will be equipped with principles, knowledge and skills for the design and construction of Website and Web Application Development using Open Source Language PHP.
2. On completion of this course, a student will be able to develop a web application using PHP technologies.
3. Students will demonstrate the skills and project-based experience needed for entry into web application and development careers.
4. Students will be able to compare multiple web technologies to create advanced, dynamic & effective website by the using of HTML, Java script, MySQL, CSS and PHP.
5. Students will acquire knowledge and Skills for creation of Web Site using PHP and MySQL.

No. of Credits: 4

UNITS

No. of Lectures

Unit I : Introduction:

15 Lectures

Introduction of PHP, Embedding PHP with HTML, Enhancing further, PHP Language Basics: Using variable in PHP, understanding Data types, operator and expressions. Making decisions: simple decision with if statements, switch, ternary operator, do while loop, for statement, break, loop skip iteration, nested loop, Function: calling functions, working with variable functions, own functions references, recursive functions.

Arrays: creating and accessing array elements, looping through arrays, multidimensional array, manipulating array
Strings: creating and accessing strings, searching strings, replacing text within strings and formatting strings

Unit II : Handling HTML forms with PHP:

15 Lectures

HTML forms work, capture form data with PHP, multi value fields, web forms with PHP, storing PHP variables in forms, create file upload forms, redirecting PHP

Unit III : Introducing Database and SQL:

15 Lectures

Deciding how to store data, quick play with MYSQL, connecting to MYSQL from PHP, retrieving data from MYSQL with PHP.

Manipulating MYSQL data with PHP insert, update, delete records- Working with files and directories: understanding files and directories, getting information on files, opening and closing files, reading files and writing files , file permissions, Copying ,renaming and deleting files, working with directories.

Unit IV : Advanced PHP Programming

15 Lectures

Cookies – What is Cookie, Cookie Syntax, How to Create, Store, Retrieve and Delete Cookie. PHP File Upload – Create an Upload-File Form, Upload Script and Save Uploaded file, putting restrictions on uploads.

Session – What is Session? Creating, Storing and Destroying Sessions. Classes & Object – OO Concepts, Define Class, Class Attributes, An Object, Creating an Object, Object Properties & Methods, Object constructors and destructors, Static Method, Class Inheritance, Abstract Class, Implement Inheritance.

.Recommended Reading :

1. PHP Concepts Unleashed For Novice – Vol I, Evincepub Publishing by Dr. Poornima G Naik, Dr. Kavita S Oza
2. PHP Concepts Unleashed For Novice-Vol II, eBooks2go, Dr. Poornima G Naik, Dr. Kavita S Oza
3. Beginning PHP 5.3, Wiley India Edition, 2012 , Matt Doyle
4. PHP6 and MySQL, Wiley India 2010, Second Edition, , Steve Suehring, Tim Converse and Joyce Park
5. PHP: A Beginners guide, TataMcgraw Hill, 2009., Vikram Vaswani,
6. Core PHP Programming, Atkinson Leon, Suraski Zeev, Pearson Publication
7. PHP 6 and MySQL 5, Pearson Education, 2008. Larry Ullman
- 8.

M. Sc. Tech Mathematics (Part II) (Semester IV)
(Introduced from June 2019 onwards)
Choice Based Credit System

Course code: **MTT – 405**

Title of Paper: Java Programming

Course outcomes: Upon successful completion of this course, the student will be able to --

1. understand basic concepts of Java such as operators, classes, objects, inheritance, packages, enumeration and various keywords
2. Identify classes, objects, members of a class and relationships among them needed for a specific problem
3. demonstrate the concepts of polymorphism and inheritance
4. implement Exceptional handling mechanism
5. design applications of Java using Java applet, Event Handling, Abstract Window Toolkit and database connectivity

No. of Credits: 4

UNITS

No. of Lectures

Unit – I

15 Lectures

Getting Started with Java: The Java Virtual Machine, The Editions of Java, A Simple Java Program.

Java Fundamentals: Java Keywords, Identifiers, Java's Eight Primitive Data Types. **Control Structures:** Flow of Control, Boolean Logic, Boolean Operators, The if Statements, The if/else Statements, The Switch Statements, The While Loop, The do/While Loop, For Loop. **Classes and Objects, Garbage Collection.**

Unit – II

15 Lectures

Method: Method Call Stack, Method Signature, Call by Value, Overloading Methods, Constructors, A Class with Multiple Constructors, Using this in Constructor. **Understanding Inheritance:** The is a Relationship, Single Versus Multiple Inheritance, The Java Lang. Object Class, Method Overriding, The Super Keyword, The Final Keyword, Invoking a Parent Class Constructor. **Advanced Java Language Concepts:** Packages, The Access Specifies, Encapsulation, Understanding Static Members, Accessing Static Fields and Methods, Static Initializes, Instance Initializes. **Polymorphism and Abstraction:** Polymorphism, Casting References, The Instance of Keyword, Virtual Methods, Abstraction, Abstract Classes, Abstract Methods.

Unit – III

15 Lectures

Interfaces: User-Defined Interfaces, Implementing an Interfaces, Extending Interfaces, Interfaces and Polymorphism. **Exception Handling:** Flow of Control of Exceptions, Catching Exceptions, Writing try/catch Blocks, Multiple catch Blocks, Handle or Declare Rule, Declaring Exceptions, The throws Keyword, Throwing Exceptions The Finally Keyword, Overridden Methods and Exceptions, User-Defined Exceptions.

JDBC-ODBC Connectivity

Unit – IV

15 Lectures

An Introduction to GUI Programming: AWT Versus Swing, Creating Windows, Containers and Components, Layout Managers, Panels, **GUI Components and Event Handling:** The Delegation Model, The Event Listener Interfaces, Creating an Event Listener, Registering a Listener with an Event Source, **Applets:** The java.applet.Applet Class, Swing Applets, Life Cycle of an Applet.

Recommended Books:

1) Richard F. Raposa, : Learning JAVA, Wiely Publishing Inc.

Reference Books:

1. Herbert Schildt: The Complete Reference to JAVA , Fifth Edition

2. V.V. Bhaskar, P. V. Subba Reddy: Object Oriented Programming Through JAVA, Scitech Publications (India) Pvt. LTD.

3. Fundamentals of Core JAVA Volume –I & II

M. Sc. Tech. Mathematics (Part II) (Semester IV)
(Choice Based Credit System)
(Introduced from June 2019 onwards)

Course Code: MTT 406

Title of Course: Lab Work IV

Specific Objectives: Objectives are to apply theory studied in computer based papers in the semester.

No. of Credits: 5

The programs related to Programming with Java and PHP with MySQL

Practical :50 Marks(Internal Examiner).

Project : 50 Marks(External Examiner).

1. Nature of the Theory Question Papers:

1. There shall be 7 questions each carrying 16 marks
2. Question No.1 is compulsory. It consists of objective type questions.
3. Students have to attempt any four questions from Question No.2 Question No.7.
4. Question No.2 shall consists short-answer type sub-questions
5. Question No.2 Question No.7 shall consists descriptive-answer type sub-questions.

2. Nature of the Lab work Question Papers:

Lab Work Examinations will be conducted at the end of semester. The exam will be conducted in 2 sessions.

1. Practical Examination session (50 Marks)
2. Project Viva (50 Marks)

In Practical Examination there shall be 2 sections. In section 1 there shall be 2 questions each of 20 marks, of which a student has to attempt any 1 question. In section 2 there shall be 10 questions each of 2 marks. There shall be 10 marks for practical assignments.