

PO And Co:

- ❖ F.Y.B.Sc.
- ❖ S.Y.B.Sc.
- ❖ T.Y.B.Sc.

1. Programme Specific Outcomes

- Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study. A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- Ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.
- Introduction to various courses like group theory, ring theory, calculus, metric spaces, discrete mathematics.
- Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.

2. Course Outcomes

FYB.SC MATHEMATICS

Semester I

Course (Paper) Name and No.: Calculus & Paper I USMT 101

- CO1 Define Bounded set, Supremum and Infimum of a set
- CO2 Determine the convergence of sequences of real numbers
- CO3 Examine the properties of sequences of real numbers
- CO4 Classify the first order differential equation

Course (Paper) Name and No.: Algebra I & Paper II USMT 102

- CO1 Explain the basic concepts of set theory
- CO2 Examine the properties of functions and relations.
- CO3 Apply well-ordering property, Induction theorems and Binomial theorem. CO4 Analyse properties of the divisibility and congruence relations.

Course: Mathematics Practical-I Course Code: USMTP01

- CO1 Explain the properties of real number
- CO2 Solve the first order first degree differential equation
- CO3 Examine the properties of sets, functions and relations.
- CO4 Solve the problems by using Induction theorems, well ordering principle, binomial theorems and congruence relations

Semester II

Course (Paper) Name and No.: Calculus II & Paper I USMT 201

- CO1 Evaluate limit of a function
- CO2 Examine Continuity of a function
- CO3 Identify the differentiable function
- CO4 Find successive differentiation

Course (Paper) Name and No.: Discrete Mathematics & Paper II USMT 202

- CO1 Relate the system of linear equations and matrices
- CO2 Determine symmetries and permutations
- CO3 Examine properties of polynomials and the relation between roots and coefficients
- CO4 Find solution of the polynomials by using different method

Course: Mathematics Practical-II Course Code: USMTP02

- CO1 Find limit and continuity of a function

- CO2 Apply second derivative test to find local extrema
- CO3 Solve the system of linear equations
- CO4 Determine symmetries, permutations and roots of the polynomials

Class: S.Y.B. Sc.

Mathematics

Semester III

Course (Paper) Name and No.: Calculus-III & Paper I USMT 301

- CO1 Evaluate limit of a functions of several variables
- CO2 Examine continuity of a functions of several variables
- CO3 Identify the differentiable functions
- CO4 Apply multivariable calculus in optimization problems

Course (Paper) Name and No.: Linear Algebra I & Paper II USMT 302

- CO1 Define vector spaces and subspaces
- CO2 Relate Matrices and linear transformations
- CO3 Find basis and dimension of a vector space over \mathbb{R}
- CO4 Evaluate the determinant

Course (Paper) Name and No.: Ordinary Differential Equations & Paper III USMT 303

- CO1 Define the basic concepts of graph theory
- CO2 Examine the properties and applications of graph
- CO3 Analyze the properties of permutation functions, Pascal's Identity, Circular Permutation and Stirling numbers.
- CO4 Apply Pigeonhole Principle, Binomial Theorem, Inclusion and Exclusion Principle.

Course (Paper) Name and No.: Mathematics Practical-III USMTP03

- CO1 Evaluate limit, continuity and differentiability of functions of several variables.

- CO2 Explain properties of vector space, linear transformation and determinant
- CO3 Classify the different types of graphs according to their properties.
- CO4 Solve the problems by using Pigeonhole Principle, Binomial Theorem, Inclusion and Exclusion Principle and permutations.

Semester IV

Course (Paper) Name and No.: Multivariable Calculus & Paper I USMT 401

- CO1 Identify Riemann integrability of functions
- CO2 Apply fundamental theorem to definite integrals
- CO3 Define Beta and Gamma functions
- CO4 Examine convergence of Improper Integrals

Course (Paper) Name and No.: Linear Algebra II & Paper II USMT 402

- CO1 Explain properties of inner product space
- CO2 Determine orthogonality in inner product space
- CO3 Find eigenvalues and eigenvectors
- CO4 Identify diagonalizable matrix

Course (Paper) Name and No.: Numerical Methods & Paper III USMT 403A

- CO1 Recall the methods to solve the first order differential equations.
- CO2 Solve second order linear differential equations by using variation of parameter, reduction method and method of undetermined coefficients
- CO3 Apply the power series method to find the solution of second order differential equations.
- CO4 Solve second order differential equations by using Laplace Transform

Course: Mathematics Practical-IV Course Code: USMTP04

- CO1 Determine properties of Riemann integration , indefinite and improper integrals
- CO2 Explain properties of inner product space, eigenvalues , eigenvectors and diagonalizable

CO3 Apply power series method and different techniques to find the solution of second order differential equations.

CO4 Solve the differential equations by using Laplace Transform techniques such as SEM, STM, TEM, ESCA, Auger spectroscopy and ICPAE

T.Y.B.Sc.

Course USMT 501: Multivariable Calculus II

1. Students will get knowledge of basic concepts, tools and techniques of integral calculus and will be able to use them to solve problems from real-life applications including science and engineering problems involving areas, volumes, centroid, Moments of mass and center of mass Moments of inertia.
2. Learners will be able to examine vector fields and will be able to define and evaluate line integrals using the Fundamental Theorem of Line Integrals and Green's Theorem and can compute arc length.

Course USMT 502: Group Theory

1. Students will have a working knowledge of important mathematical concepts in abstract algebra such as definition of a group, subgroups, order of an element with emphasis on problem solving.
2. Students will get knowledge about cosets, normal subgroups, group homomorphisms, external direct products and some results in connection with them.
3. Students will know about cyclic groups, cyclic subgroups, generators of cyclic groups some properties and results in connection. They will also learn characterization of cyclic groups.

Course USMT 503: Topology of Metric Space

1. Students will get full knowledge of basic concepts of metric spaces. It extends the ideas of open sets, closed sets and concepts such as compactness and complete Metric space.
2. Students will be able to think logically and will be able to prove or disprove any statement logically.

Course USMT 5C4: Graph Theory

1. Students will get knowledge of graphs and its various types.
2. Students will get knowledge of trees, its types and its applications.
3. Students will get knowledge of Eulerian and Hamiltonian graphs with their properties.

Course USACCS501: Applied Component

1. Students will get practical knowledge about database management system.
2. Students will learn SQL commands and functions for database management as well as they will get basic knowledge in PL/SQL.
3. Students will be get basic introduction in java programming in which they will learn java basics,

- what is class in java, creating objects, arrays and access controls.
4. Students will also get knowledge about inheritance in java, exception handling and packages.

Course USMTP05: Practicals

1. Problem solving skills of students will be enhanced.
2. Theoretical concepts will be strengthened by solving maximum no. of problems.
3. Due to one-to-one interaction with the teacher, doubts of the students will be cleared.
4. Students will be able to apply mathematical concept or any result to solve problems.

Course USMT 601: Basic Complex Analysis

1. Students will be able to analyse sequences and series of analytic functions and types of convergence.
2. Students will also be able to evaluate complex contour integrals directly and by the fundamental theorems,
3. Students will be able to evaluate complex integration by applying the Cauchy integral theorem in its various versions, and the Cauchy integral formula.
4. Students will also be able to represent functions as Taylor, power and Laurent series, classify singularities and poles, and will be able to find residues and evaluate complex integrals using the residue theorem.

Course USMT 602: Ring Theory

1. Students will get working knowledge about rings, subrings, units in ring, characteristic of rings.
2. Students will learn important mathematical concept such as integral domains, fields, ideals, quotient rings, prime ideals, maximal ideals, homomorphism and isomorphism of rings.
3. Students will also learn mathematical concepts such as Euclidean domain, PID, Divisibility in rings, polynomial rings, irreducible and prime elements, UFD.
4. Students will also understand the connection and transition between previously studied mathematics and more advanced mathematics.

Course USMT 603: Topology of Metric Spaces and Real Analysis

1. Students will get knowledge of continuous functions and will be able to check whether the given function is continuous or not.
2. Students will get knowledge of connected metric space and will be able check whether the given set is connected or not in a given metric spaces.
3. Students will get knowledge of convergence concepts of sequences and series of functions, power series. The treatment of this course will enable the learner to explain their reasoning about analysis with clarity and rigour.

Course USMT 6C4: Graph Theory and Combinatorics

1. Students will get knowledge of graph coloring, vertex and edge chromatic number. Students will be able to find chromatic polynomials of graphs.
2. Students will get knowledge of planar graphs, planarity of some special graphs and related theorems.
3. Students will get knowledge of directed graphs, networks, flow and cuts in a network, Ford-Fulkerson algorithm and will be able to solve problems related to it.
4. Students will get knowledge of Inclusion-Exclusion principle with applications, Rook polynomial, recurrence relations and generating functions and students will be able to find system of distinct representatives of a family of subsets of finite set Y .

Course USACCS601: Applied Component

1. Students will be introduced to java applets, graphics, font and colour class, AWT package.
2. Students will learn basics of Python programming language, selection statements and loops.
3. Students will get knowledge about Strings, Lists and Dictionaries and basic operations on them. They will also learn to design their own functions in python.
4. Students will also get knowledge about Exception handling in Python. They will also learn how to do mathematics using python such as working with numbers, symbolic maths using sympy, factorizing and expanding, solving equations, plotting graphs etc.

Course USMTP06: Practicals

1. Problem solving skills of students will be enhanced.
2. Theoretical concepts will be strengthened by solving maximum no. of problems.
3. Due to one-to-one interaction with the teacher, doubts of the students will be cleared.
4. Students will be able to apply mathematical concept or any result to solve problems.