

Department of Mathematics

B.Sc. Mathematics

Programme outcomes

PO1: Scientific temper will be developed in Students.

PO2: Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science stream.

PO3: Students will become employable; they will be eligible for career opportunities in Industry, or will be able to opt for entrepreneurship.

PO4: Students will possess basic subject knowledge required for higher studies, professional and applied courses like Management Studies, Law etc.

PO5: Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.

Programme specific outcomes

PSO1: A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology.

PSO2: A student should get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences.

PSO3 : Student is equipped with mathematical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.

PSO4: Student should be able to apply their skills and knowledge that is translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

PSO5: Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

Course outcomes

F. Y. BSc. (Autonomous)

Course outcomes F. Y. B.Sc. (2022-23) : Semester 1

Mathematics Paper I : 22-MT-111 : Algebra

CO1: Student gets the knowledge about fundamental concepts of Mathematics such as set theory and number theory

CO2: Student will learn applications basic number theory

CO3: Computational skills are enhanced

CO4: Student will learn basic complex analysis.

Mathematics paper II : 22-MT-112 : Calculus 1

CO1. By studying this course students are able to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

CO2. Student can able to learn all the properties of real numbers and all the basic mathematical concepts about the real number set like continuity , differentiability

CO3. By studying the basic concepts and geometrical interpretation of the theorems in calculus students will be able to relate the graphs and theoretical concepts in calculus very efficiently.

CO4. Students can apply the basic concepts in Calculus in higher mathematics.

CO5. Student will be able to supply their skills and knowledge that is translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

Semester 2

Mathematics paper I : 22-MT-121 : Analytical geometry

CO1: Student will learn geometry of two dimensions and three dimensions

CO2: Student will be able to reduce general equation of second degree to its standard form

CO3: Student will learn geometry of line, plane and sphere and their equations in various forms in detail.

CO4: Analytical skills will get enhanced

Mathematics paper II : 22-MT-122 : Calculus II

CO1. By studying this course the students can develop the theoretical as well as applied, computational skills and gains the confidence in proving theorems and solving problems.

CO2. By studying this course, students will be familiar with all the basic concepts of differential equations and how to use all these basic concepts for the higher study in differential equations.

CO3. By studying the basic concepts and geometrical interpretation of the theorems in differentiability students will be able to relate the graphs and theoretical concepts in calculus very efficiently.

CO4. By studying the different techniques of solving the differential equations, students can form differential equations and solve them efficiently and also they will become familiar with applications of those differential equations.

CO5. This course will be useful to create confidence in students for equipping themselves with that part of Mathematics which is needed for various branches of Science or Humanities in which they have aptitude for higher studies and original work.

S. Y. BSc. (2019 pattern)

Course: MT 231 Calculus Of Several Variables

CO1: To study functions and several variables.

CO2: To study the notion of Continuity and Differentiability of multivariate functions.

CO3: To find extreme values of multivariable functions using derivatives.

CO4: To learn evaluation of double and triple integration and its application to area and volume.

Course: MT 232(A) Numerical Methods And It's Applications

CO1: To learn to apply the various numerical techniques for solving real life problems.

CO2: The problems which cannot be solved by usual formulae and methods can be solved approximately by using numerical techniques.

CO3: To fit curve to the data by using 3 different methods of interpolation.

CO4: To find approximate solutions to differential equations occurring in engineering sciences.

Course: MT 241 Linear Algebra

CO1: To learn the importance and applications of linear transformation.

CO2: To learn matrix and it's properties , system of equations which has wide variety of applications in various science subjects .

CO3: To learn basic concepts of vector space which is used in other pure mathematical subjects

and engineering

CO4: To get well equipped with Mathematical Modelling abilities.

Course : MT 242(B) Dynamical Systems

CO1: Students learn to find Eigen values and Eigen vectors of a matrix which is used in the study

of vibrations, chemical reactions and geometry.

CO2: Theoretical concepts are strengthened by solving maximum no. of problems

CO3: Study of planar linear system and formation of mathematical model and their solutions

Course: MT 233 and MT 243 Mathematics Practical

CO1: Problem solving skills of students are enhanced.

CO2: Theoretical concepts are strengthened by solving maximum no. of problems

CO3: Due to one to one interaction with the teacher doubts of the students get cleared if any.

CO4: Students learn how to apply mathematical concepts to practical and real life problems.

CO5: Interdisciplinary approach is developed.

T. Y. BSc. (2019 pattern)

T.Y.B.Sc: Semester-V

DSE-1A: MT 351: Metric Spaces (2 Credits)

Course Learning Outcomes: The course will enable the students to:

- 1) Understand the introductory concepts of metric spaces;
- 2) Correlate these concepts to their counter parts in modern analysis by studying examples;
- 3) Learn to analyze mappings between spaces.
- 4) Attain background for advanced courses in real analysis, functional analysis, and topology.
- 5) Appreciate the abstractness of the concepts such as open balls, closed balls, compactness, connectedness etc. beyond their geometrical imaginations.

Course: DSE-1B: MT: 352 Real Analysis - I (2 Credits)

Course Learning Outcomes: The course will enable the students to:

- 1) Learn the basic facts in logic and set theory.
- 2) Learn to define sequence in terms of functions from \mathbb{N} to a subset of \mathbb{R} and to understand several properties of the real line.
- 3) Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.
- 4) Use the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.

Course: DSE-2A : MT-353: Group Theory (2 Credits)

Course Learning Outcomes: The course will enable the students to:

- 1) Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc;
- 2) Analyze consequences of Lagrange's theorem
- 3) Learn about structure preserving maps between groups and their consequences.
- 4) Explain the significance of the notion of cosets, normal subgroups, and factor groups.

Course: DSE-2B : MT-354: Ordinary Differential Equations (2 Credits)

Course Learning Outcomes: The course will enable the students to:

- 1) Understand the genesis of ordinary differential equations.
- 2) Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order.
- 3) Grasp the concept of a general solution of a linear differential equation of an arbitrary order and also learn a few methods to obtain the general solution of such equations.

Course: DSE-3A : MT 355(A): Operations Research(2 Credits)

Course Learning Outcomes: The course will enable the students to:

- 1) Analyze and solve linear programming models of real-life situations.
- 2) The graphical solution of LPP with only two variables, and illustrate the concept of convex set and extreme points. The theory of simplex method is developed.

- 3) The relationships between the primal and dual problems and their solutions with applications to transportation, assignment and two-person zero-sum game problem.

DSE-3A : MT-355(B): Differential Geometry (2 Credits)

Course Learning Outcomes: The course will enable the students to :

- 1) Gain an understanding to solve problems with the use of differential geometry to diverse situations in mathematical contexts.
- 2) Develop different properties associated with curves and surfaces.
- 3) Demonstrate a depth of understanding in advanced mathematical topics in relation to geometry of curves and surfaces. Learn to analyze mapping between spaces.
- 4) Apply the theory of differential geometry to specific research problems in mathematics or other fields.

Course: DSE-3A : MT-355(C): C- Programming (2 Credits)

Course Learning Outcomes:

- 1) To provide complete knowledge of C language
- 2) To develop logic which will be helpful to create programs
- 3) To learn basic programming constructs
- 4) After the completion of this course, the students will be able to develop applications.

Course: DSE-3B : MT-356(A): Machine Learning- I (2 Credits)

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

- 1) Gain knowledge about basic concepts of Machine Learning.
- 2) Identify machine learning techniques suitable for a given problem.
- 3) Solve the problems using various machine learning techniques.

DSE-3B : MT-356(B): Number Theory (2 Credits)

Course Learning Outcomes: The course will enable the students to learn :

- 1) Some of the open problems related to prime numbers.
- 2) About number theoretic functions and modular arithmetic.
- 3) The Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues.

Course: DSE-3B : MT-356(C): Laplace Transform and Fourier Series(2 Credits)

Course Learning Outcomes: This course will enable the students to learn :

- 1) Students will be able to know the use of Laplace transform in system modeling, digital signal processing, process control.
- 2) Solve an initial value problem for an nth order ordinary differential equation using the Laplace transform.
- 3) Find the Fourier series representation of a function of one variable.

Course: SEC -I MT-3510 : Programming in Python-I

Course Learning Outcomes: At the end of the course:

- 1) The student will be able to explain basic principles of Python programming language.
- 2) The student will implement object oriented concepts.

Course: SEC-II MT-3511: LaTeX for Scientific writing

Course Learning Outcomes: After studying this course the student will be able to:

- 1) Write a simple LaTeX input document based on the article class.
- 2) Turn the input document into pdf with the pdflatex program.
- 3) Format Words, Lines, and paragraphs.
- 4) Understand how to present data using tables.

T.Y.B.Sc: Semester-VI

Course: DSE-4A: MT: 361 -Complex Analysis (2 Credits)

Course Outcomes: The completion of the course will enable the students to:

- 1) Understand the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations.
- 2) Evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.
- 3) Expand some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals.
- 4) Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.

Course: DSE-4B: MT: 362 -Real Analysis-II (2 Credits)

Course Outcomes: The course will enable the students to learn about;

- 1) Some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.
- 2) Beta and gamma functions and their properties.

- 3) Recognize the difference between point wise and uniform convergence of a sequence of functions.
- 4) Illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability and integrability.

Course: DSE-5A: MT: 363 –Ring Theory (2 Credits)

Course Outcomes: The course will enable the students to learn about;

- 1) The fundamental concept of Rings, Fields, subrings, integral domains and the corresponding morphisms.
- 2) Learn in detail about polynomial rings fundamental properties of finite field extensions and classification of finite fields.
- 3) Appreciate the significance of unique factorization in rings and integral domains.

Course: DSE-5B: MT: 364 –Partial Differential Equations (2 Credits)

Course Outcomes: The course will enable the students to learn about;

- 1) Formulate, classify and transform partial differential equations into canonical form.
- 2) Solve linear partial differential equations using various methods and apply these methods in solving some physical problems.
- 3) Solve Laplace equations using various analytical methods demonstrate uniqueness of solutions of certain kinds of these equations.

Course: DSE-6A: MT365 (A) –Optimization Techniques(2 Credits)

Course Outcomes: The course will enable the students to learn about;

- 1) Understand fundamentals of Network Analysis using CPM and PERT.
- 2) Solve a sequencing problem for various jobs and machines.
- 3) To understand solutions of mixed strategy games

Course: DSE-6A: MT365 (B) –Calculus of Variation and Classical Mechanics(2 Credits)

Course Outcomes: The course will enable the students to;

- 1) Understand problems, methods and techniques of calculus of variations.
- 2) Understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body.
- 3) Deal with the kinematics and kinetics of the rectilinear and planar motions of a particle including the constrained oscillatory motions of particles.

- 4) Determine the center of gravity of some materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight.

Course: DSE-6A: MT365 (C) –Financial Mathematics (2 Credits)

Course Outcomes: The course will enable the students to;

- 1) Describe and explain the fundamental features of financial instruments.
- 2) Demonstrate a clear understanding of financial research planning, methodology and implementation.
- 3) Demonstrate understanding of basic concepts in linear algebra, relating to linear equations, matrices and optimization.
- 4) Demonstrate understanding of concepts relating to functions and annuities.

Course: DSE-6B: MT366 (A) –Machine Learning-II (2 Credits)

Course Outcomes:

- 1) To learn understand and practice machine learning approaches to study modern computing big data technologies
- 2) Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
- 3) Scaling up machine learning techniques focusing on industry applications.

Course: DSE-6B: MT366 (B) –Computational Geometry(2 Credits)

Course Outcomes: The course will enable the students to;

- 1) Construct algorithms for simple geometrical problems.
- 2) Characterize invariance properties of Euclidean geometry by groups of transformations.
- 3) Describe and construct basic geometric shapes and concepts by computational means.

Course: DSE-6B: MT366 (C) –Lebesgue Integration (2 Credits)

Course Outcomes: The course will enable the students to;

- 1) To understand the concept of measure and properties of Lebesgue measure.
- 2) To study the properties of Lebesgue integral and compare it with Riemann integral.

SEC III : MT-3610 –Programming in Python-II

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

- 1) Demonstrate the use of Python in Mathematics such as operations research and computational geometry.
- 2) Study graphics and design and implement a program to solve a real world problem.

3) The students will implement the concepts of data with python and database connectivity.

Course: SEC IV MT-3611 –Mathematics into LaTeX(2 Credits)

Course Outcomes: After studying this course the student will be able to;

- 1) Typeset mathematical formulas,
- 2) use nested list, tabular and array environments.
- 3) Import figures and pictures that are stored in external files.

**Course: DSE-1 MT357- Practical Course Lab 1, DSE-2 MT358- Practical Course Lab 2,
: DSE-3 MT359- Practical Course Lab 3, DSE-4 MT367- Practical Course Lab 1,
: DSE-5 MT368- Practical Course Lab 2, : DSE-6 MT369- Practical Course Lab 1.**

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