

GOUR MAHAVIDYALAYA

DEPARTMENT OF

MATHEMATICS COURSE &

PROGRAM OUTCOMES

OF

MATHEMATICS NEP 2020

Session: 2023-24 & 2024-25

PROGRAMME OUTCOME	<p>Formulate and develop mathematical arguments in a logical manner. Also when there is a need for information, the student will be able to identify, locate, evaluate, and effectively use than information for handling issues or solving problems at hand. Acquire good knowledge and understanding in advanced areas of mathematics and its applications. More specifically-</p> <ul style="list-style-type: none">• 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.• aAbility to analyse a problem, identify and define the computing requirements, which may be appropriate to its solution.• Introduction to various courses like group theory, ring theory, field theory, metric spaces, number theory.• Enhancing students' overall development and to equip them with mathematical modelling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment. <p>Ability to pursue advanced studies and research in pure and applied mathematical science.</p>
PROGRAMME SPECIFIC OUTCOME	<p>Students will be able to apply critical thinking skills to solve problems that can be modelled mathematically, to critically interpret numerical and graphical data, to read and construct mathematical arguments and proofs, to use computer technology appropriately to solve problems and to promote understanding, to apply mathematical knowledge to a career related to mathematical</p>

MTM-DC-MJ-101

Algebra

Credit:

4

Full Marks: 75(CA: 25, SE: 50)

Learning Objectives:

The principal aim of this course is to introduce the concepts of complex numbers and to present a systemic introduction to theory of equations, number theory and basic course on algebra, linear algebra and its applications.

Learning Outcomes:

On completion of the course, the students would

1. familiarize with the concepts of complex numbers and gain knowledge about its various properties and its applications to solve various problems.
2. gain knowledge about a basic introduction to algebra which has different applicability in various branches of science.
3. be introduced with the basic concepts of number theory and its applications in advanced mathematics and in various practical fields e.g., cryptography, computer science.
4. gain knowledge about system of linear equations and learn various methods to solve them.
5. demonstrate the knowledge of characteristic polynomials, eigenvalue, eigenvectors to solve various problems.
6. familiarize with various methods to find roots of a polynomial equation and apply them to practice.
7. apply the concepts of eigenvalue, eigenvectors to verify the diagonalization of a square of matrix. gain idea about real quadratic forms of a matrix and solve related problems.

MTM-DC-MJ-201

Calculus & Analytical Geometry

Credit: 4

Full Marks: 75 (CA: 25, SE: 50)

Learning Objectives:

The primary objective of this course is to study calculus and its applications in various fields and understand the basic knowledge of geometry in two and three dimensional spaces.

Learning Outcomes:

On completion of the course, the students would

1. gain knowledge about higher order derivatives and its applications, concavity of curves, asymptotes, and curve tracing techniques.
2. be able to parametrize curves, sketch functions and plot them.
3. gain knowledge about reduction formula for integration of functions like $\sin nx$, $\sin^m x$, $\sin^n x$ etc., area of surface of revolution, parametric curves etc.
4. familiarize with the concepts of limit, continuity, and differentiability of functions of single variable and apply them to solve various problems.
5. be able to apply the knowledge of geometry in 2D to find the angle between two straight lines, to find the equation of bisectors, equation of tangent and normal.
6. gain knowledge about classification of conics and conicoid, polar equation of conics.
7. able to visualize standard quadratic surfaces like sphere, cone, ellipsoid etc.

MTM-DC-MJ-301

Abstract Algebra

Credit: 4

Full Marks: 75 (CA: 25, SE: 50)

Learning Objectives:

The primary objective of this course is to introduce the fundamentals of several algebraic structures including groups, rings, integral domains and fields. This course is intended to develop the students' ability to handle abstract ideas of Mathematics and Mathematical proofs.

Learning Outcomes:

On completion of this course, the students will be able to:

1. Acquire knowledge of important mathematical concepts in abstract algebra such as definition of a group, order of a finite group, order of an element in a group, subgroups, centralizer, normalizer, centre of a group, cyclic groups, permutation groups, etc.
2. Familiar with cosets, normal subgroups, quotient groups, group homomorphisms, isomorphisms and the isomorphism theorems.
3. Understand the concepts of rings, subrings, integral domains and fields, characteristic of a ring and ring homomorphisms.
4. Comprehend ideals including prime and maximal ideals, ring homomorphisms, isomorphisms, isomorphism theorems, fields of quotients, polynomial rings, etc

MTM-DC-MJ-302

Differential Equations

Credit: 4

Full Marks: 75 (CA: 25, SE: 50)

Learning Objectives:

The fundamental goal of this course is to study ordinary and partial differential equations through analytic and qualitative approaches and its applications in various physical problems.

Learning Outcomes:

On completion of the course, the students would

1. gain knowledge about qualitative analysis of the ordinary differential equations.
2. get idea of ordinary and partial differential equations, linear and non-linear equations, concepts of order and degree.
3. be able to demonstrate the knowledge of Existence and Uniqueness theory for Initial Value Problems in ordinary differential equations.
4. be able to apply the knowledge of ordinary differential equations to solve problems in different areas of applied mathematics.
5. Learn about the various techniques to solve ordinary differential equations and apply them to solve various physical problems.

6. gain knowledge about the distinctive features of various types of ordinary differential equations.
7. be familiarize with the concepts of equilibrium points and study stability analysis, interpretation of phase plane.
8. learn about solution techniques to solve partial differential equations by Lagrange's and Charpit's methods and apply them to solve various problems.
9. be introduced with the concepts of canonical forms of first order linear partial differential equations.

MTM-DC-MJ-401

Real Analysis I

Credit: 4

Full Marks: 75 (CA:25 , SE: 50)

Learning Objectives:

The main objective of this course is to comprehend theoretical knowledge and have practical skills in the subject of real analysis and to demonstrate an ability to initiate and sustain in-depth study relevant to real analysis.

Learning Outcomes:

On completion of this course, the students will be able to:

1. Demonstrate competence with the algebraic and order properties of real numbers, describe the real line as a complete ordered field, and understand the topology of the real line.
2. Acquire knowledge of elementary properties of real sequences by finding limits and proving results involving sum, difference, product and quotients of sequences, and apply several tests to examine convergence of real series.
3. Understand the concepts of limits, continuity and uniform continuity of real-valued functions, and analyse their several properties.
4. Demonstrate differentiability of real-valued functions and its various properties, apply Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem to solve assorted problems in the context of real analysis as well as calculus.

MTM-DC-MJ-402

Mechanics

Credit: 4

Full Marks: 75 (IA: 25, SE: 50)

Learning Objectives:

The objective of this course is to build up problems based mathematical skills in the areas of mechanics and apply these skills to the solution of a variety of practical problems appearing in physical sciences.

Learning Outcomes:

On completion of this course, the students will be able to

1. Understand concepts of kinematics of a particle, Newton laws of motion, law of gravitation and solve related problems.
2. Solve a variety of problems based on Work, power, kinetic energy, conservative forces-potential energy, energy conservation in a conservative field, Stable equilibrium and small oscillations and impulsive forces.
3. Solve assorted problems in particle dynamics including rectilinear motion, simple harmonic motion, oscillations, motion of elastic strings and springs, etc.
4. Work out problems on planar motion of a particle, orbits in a central force field, motion under the attractive inverse square law, Kepler's laws on planetary motion, etc.

MTM-DC-MJ-403

Numerical Methods & C Programming Language

Credit: 4

Full Marks: 75 (CA: 25, SE: 50)

Learning Objectives:

The objective of this course to demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems, together with an overview of the C-Programming languages.

Learning Outcomes:

On completion of this course, the students will be able to

1. Understand the importance of error analysis and their propagation, and familiar with the methods of solving algebraic and transcendental equations.
2. Learn the methods of solving system of linear and non-linear equations, and understand the techniques of interpolation and numerical differentiation.
3. Acquire knowledge of numerical integration, algebraic eigenvalue problem and initial value problems
4. Develop a C program, control its sequence, and produce logical outputs.