Dayanand Vedic College, Orai
DEPARTMENT OF MATHEMATICS
National Education Policy-2020
PROGRAM OUTCOME OF UG B.Sc. and PG M.Sc. Mathematics

Programme outcomes

Knowledge outcomes

(I) After completing M.Sc. (Mathematics) Programme students will:

1. will get advanced knoeledge of principles, methods and clear perception of innumerouspower of mathematical ideas and tools.

2. will be able to apply their skills and knowledge, that is translate information presentedverbally into Mathematical form select and use appropriate mathematical formulae or techniques in order to process the information and draw relevant conclusion

3. will be able to find out or analyze scientific reasoning for various things.

4. Student will get knowledge about both pure as well as applied mathematics branches.

Skill outcomes

(II) After completing B.Sc. (Mathematics) Programme students will :

1. get adequate exposure to global and local concerns that explore them many aspects of Mathematical sciences

2. get a relational understanding of mathematical concepts and concerned structures

3. Communicate scientific information in a clear and concise manner both orally and inwriting or through audio video presentations

Generic outcomes:

Students will

1. Develop a positive attitude towards mathematics as an interesting and valuable subject of study

2. Develop capacity of critical reasoning, theoretical applied and communication skills.
3. Develop abilities for logical thinking and problem solving

B.Sc. I (SEMESTER-I)
Differential Calculus & Integral Calculus
Course Code: B030101T
Course outcomes:
CO1: The programme outcome is to give foundation knowledge for the students to understand basics of mathematics including applied aspect for developing enhanced quantitative skills and pursuing higher mathematics and research as well.

CO2: By the time students complete the course they will have wide ranging application of the subject and have the knowledge of real valued functions such as sequence and series. They will also be able to know about convergence of sequence and series. Also, they have knowledge about curvature, envelope and evolutes and trace curve in polar, Cartesian as well as parametric curves.
CO3: The main objective of the course is to equip the student with necessary analytic and technical skills. By applying the principles of integral he learns to solve a variety of practical problems in science and engineering.
CO4: The student is equipped with standard concepts and tools at an intermediate to advance level that will serve him well towards taking more advance level course in mathematics.

B.Sc. I (SEMESTER-II)
Matrices and Differential Equations & Geometry
Course Code: B030201T
Course outcomes:

CO1: The subjects of the course are designed in such a way that they focus on developing mathematical skills in algebra, calculus and analysis and give in depth knowledge of geometry, calculus, algebra and other theories.
CO2: The student will be able to find the rank, eigen values of matrices and study the linear homogeneous and non-homogeneous equations. The course in differential equation intends to develop problem solving skills for solving various types of differential equation and geometrical meaning of differential equation.
CO3: The subjects learn and visualize the fundamental ideas about coordinate geometry and learn to describe some of the surface by using analytical geometry.
CO4: On successful completion of the course students have gained knowledge about regular geometrical figures and their properties. They have the foundation for higher course in Geometry.

B.Sc.II (SEMESTER-III)
Algebra & Mathematical Methods
Course Code: B030301T
Course outcomes:

CO1: Group theory is one of the building blocks of modern algebra. Objective of this course is to introduce students to basic concepts of Group, Ring theory and their properties.
CO2: A student learning this course gets a concept of Group, Ring, Integral Domain and their properties. This course will lead the student to basic course in advanced mathematics and Algebra.
CO3: The course gives emphasis to enhance students' knowledge of functions of two variables, Laplace Transforms, Fourier Series.
CO4: On successful completion of the course students should have knowledge about higher different mathematical methods and will help him in going for higher studies and research.

B.Sc. II (SEMESTER-IV)
Differential Equations & Mechanics
Course Code: B030401T
Course outcomes:

CO1: The objective of this course is to familiarize the students with various methods of solving differential equations, partial differential equations of first order and second order and to have qualitative applications.
CO2: A student doing this course is able to solve differential equations and is able to model problems in nature using ordinary differential equations. After completing this course, a student will be able to take more courses on wave equation, heat equation, diffusion equation, gas dynamics, non linear evolution equation etc. These entire courses are important in engineering and industrial applications for solving boundary value problem.
CO3: The object of the paper is to give students knowledge of basic mechanics such as simple harmonic motion, motion under other laws and forces.
CO4: The student, after completing the course can go for higher problems in mechanic such as hydrodynamics, this will be helpful in getting employment in industry.

B.Sc. III (SEMESTER-V)
Group and Ring Theory & Linear Algebra
Course Code: B030501T
Course outcomes:

CO1: Liner algebra is a basic course in almost all branches of science. The objective of this course is to introduce a student to the basics of linear algebra and some of its applications.
CO2: Students will be able to know the concepts of group, ring and other related properties which will prepare the students to take up further applications in the relevant fields.
CO3: The student will use this knowledge in computer science, finance mathematics, industrial mathematics and bio mathematics. After completion of this course students appreciate its interdisciplinary nature.

B.Sc. III (SEMESTER-V)
Number Theory & Game Theory
Course Code: B030502T
Course outcomes:

CO1: Upon successful completion, students will have the knowledge and skills to solve problems in elementary number theory and also apply elementary number theory to cryptography.
CO2: This course provides an introduction to Game Theory. Game Theory is a mathematical framework which makes possible the analysis of the decision making process of interdependent subjects. It is aimed at explaining and predicting how individuals behave in a specific strategic situation, and therefore help improve decision making.
CO3: A situation is strategic if the outcome of a decision problem depends on the choices of more than one person. Most decision problems in real life are strategic.
CO4: To illustrate the concepts, real-world examples, case studies, and classroom experiments might be used.

B.Sc. III (SEMESTER-V)
Graph Theory & Discrete Mathematics
Course Code: B030502T
Course outcomes:

CO1: Upon successful completion, students will have the knowledge of various types of graphs, their terminology and applications.
After Successful completion of this course students will be able to understand the isomorphism and homomorphism of graphs. This course covers the basic concepts of graphs used in computer science and other disciplines. The topics include path, circuits, adjacency matrix, tree, coloring.. After successful completion of this course the student will have the knowledge graph coloring, color problem, vertex coloring.
CO3: After successful completion, students will have the knowledge of Logic gates, Karnaugh maps and skills to proof by using truth tables. After Successful completion of this course students will be able to apply the basics of the automation theory, transition function and table.
CO4: This course covers the basic concepts of discrete mathematics used in computer science and other disciplines that involve formal reasoning. The topics include logic, counting, relations, hasse diagram and Boolean algebra. After successful completion of this course the student will have the knowledge in Mathematical reasoning, combinatorial analysis, discrete structures and Applications.

B.Sc. III (SEMESTER-VI)
METRIC SPACES & COMPLEX ANALYSIS
Course Code: B030601T
Course outcomes:

CO1: The course is aimed at exposing the students to foundations of analysis which will be useful in understanding various physical phenomena and gives the
the student in understanding pure mathematics and in research.
CO2: After completion of this course the student will have rigorous and deeper understanding of fundamental concepts in Mathematics. This will be helpful to
CO3: Students will be able to know the concepts of *metric* space, basic concepts and developments of complex analysis which will prepare the students to take up further applications in the relevant fields.

B.Sc. III (SEMESTER-VI)
Numerical Analysis & Operation Research
Course Code: B030602T
Course outcomes:

CO1: The aim of this course is to teach the student the application of various numerical technique for variety of problems occurring in daily life. At the end of the course the student will be able to understand the basic concept of Numerical Analysis and to solve algebraic and differential equation.
CO2: The main outcome will be that students will be able to handle problems and finding approximated solution. Later he can opt for advance course in Numerical Analysis in higher Mathematics.
CO3: The student will be able to solve various problems based on convex sets and linear programming. After successful completion of this paper will enable the students to apply the basic concepts of transportation problems and its related problems to apply in further concepts and application of operations research.

M. Sc. Mathematics

Semester I
Course Code: Advanced Abstract Algebra

Course Outcomes:

Create knowledge of plane isometries. Understand group action and its applications. Apply Sylow theorem to solve problems in group theory. Understand group presentation. Explain polynomials over a ring.

Course Code: 60652; Real Analysis.

Course Outcomes:

Apply the knowledge of concepts of real analysis in order to study theoretical development of different mathematical techniques and their applications.Understand the nature of abstract mathematics and explore the concepts in further details. Identify challenging problems in real variable theory and find their appropriate solutions. Deal with axiomatic structure of metric spaces and generalize the concepts of sequences and series, and continuous functions in metric spaces.Use theory of Riemann-Stieltjes integral in solving definite integrals arising in different fields of science and engineering. Also, Extend their knowledge of real variable theory for further exploration of the subject for going into research.

Course Code: 60653; Differential Equations

Course Outcomes:

Understand ordinary differential equations of various types, their solutions, and fundamental concepts about their existence. Understand the concept and applications of eigen value problems.Apply various power series methods to obtain series solutions of differential equations. Solve problems of ordinary differential equations arising in various fields.

Course Code: 60654; Integral Equations

Course Outcomes:

Understand the methods to reduce Initial value problems associated with linear differential equations to various integral equations.Categorise and solve different integral equations using various techniques.Describe importance of Green's function method for solving boundary value problems associated with non-homogeneous ordinary and partial differential equations, especially the Sturm-Liouville boundary value problems.Learn methods to solve various mathematical and physical problems using variational techniques.

Semester II

Course Code 60656; Topology. Course Outcomes:

Develop basic concepts of topological Spaces, Identify quotient spaces. Explain spaces with special properties. Understand separation axioms.Analyze Urysohn and Tietze characterization of normality

Course Code 60657; Complex Analysis Course Outcomes:

Develop concepts of conformality. Explain fundamental theorem and Cauchy's Integral formula, Create an idea of analytical functions and related theorems.Understand power series expansion and periodic functions.

Course Code 60658; Differential Geometry Course Outcomes:

Understand the basic concepts and results related to space curves, tangents, normals and surfaces. Explain the geometry and physical properties of different types of curves and spaces. Understand principal directions and curvatures, asymptotic lines and then apply their important theorems and results to study various properties of curves and surfaces. Utilize Geodesics, it's all related terms, properties and theorems.

Course Code: 60659; Numerical Analysis Course Outcomes

Understanding the theoretical and practical aspects of the use of numerical methods. Implementing numerical methods for a variety of multidisciplinary applications and Establishing the limitations, advantages, and disadvantages of numerical methods.

M Sc Semester III

Course Code: 70651; Number Theory Course Outcomes:

Identify arithmetic functions and Dirichlet multiplication,Explain importance of prime numbers. Discuss quadratic residue and quadratic reciprocity laws.Classify symmetric and asymmetric and demonstrate concepts in cryptography.

Course Code: 70652; Mathematical Methods

Course Outcomes:

Understanding mathematical principles, integral calculus theory. Understanding function approximation and vector techniques. Understanding how to solve problems in applied settings Using mathematical techniques to analyze economic problems.Modeling economic questions in a mathematical framework and Evaluating a range of problems using mathematical techniques

Course Code: 70653; Fluid mechanics Course Outcomes:

Solve hydrostatic problems, Describe the physical properties of a fluid. Calculate the pressure distribution for incompressible fluids. Calculate the hydrostatic pressure and force on plane and curved surfaces. Identify the importance of various fluid properties at rest and in transit. Understand the concept of boundary layer theory and flow separation. Plot velocity and pressure profiles for any given fluid flow. Evaluate the performance characteristics of hydraulic turbines and pumps. Solve manometer problems, and calculate forces on submerged and floating bodies. Use conservation of mass principle to calculate flow rates through control volumes

Course Code: 70654; Mathematical Statistics Course Outcomes:

Understanding the basic principles of statistical inference, properties and knowledge of statistical models. Understanding the Being able to construct estimators and tests, and derive their properties. Applying statistical tools in business, commercial, and economical areas. Analysing problems and making better decisions for the future

Course Code: 70655; Advance Operation Research

Course Outcomes:

Solving linear programming problems using appropriate techniques and optimization solvers

Interpreting the results obtained

Developing critical thinking and objective analysis of decision problems

Introducing students to advanced methods for large-scale transportation and assignment problems

Introducing students to decision-making environments and the appropriate decision making approaches and tools to be used in each type

Course Code: 70656; Graph Theory

Course Outcomes:

Understand and explain the basic concepts of graph theory. Apply the basic concepts of mathematical logic. Analyze the basic concepts of mathematical logic.

Course Code: 70657; Special Functions

Course Outcomes:

Understand the Beta and Gamma functions, their properties and relation between these two functions, understand the orthogonal properties of Chebyshev polynomials and recurrence relations.

Course Code: 70658; Java Programming

Course Outcomes:

Write a Java program to read input from the user and display output to the console.

Write a Java program to create and manipulate objects.
Write a Java program to use inheritance and polymorphism.
Write a Java program to use a Java library or framework.
Troubleshoot and debug a Java program.
Document a Java program.

Semester IV

Course Code: 70661; Functional Analysis
Course Outcomes:
Understand a strong foundation in functional analysis, focusing on spaces (Metric Spaces, Normed Spaces, Inner Product Spaces) Operators, Fundamental Theorems and Applications.
Course Code: 70662; Measure Theory
Course Outcomes:
Formulating complex problems using appropriate measure theory terminology. Using sophisticated tools from measure theory in various areas of mathematics. Integrating simple positive measurable functions, positive measurable functions, and general L1 -functions. Deriving properties of integrals. Stating and applying the monotone convergence theorem, dominated convergence theorem, and the Fubini theorem. Describing the major concepts and results of the topics, and understanding their significance and proofs. Demonstrating understanding by using the results and arguments learned in the course to prove other results

Course Code: 70663; Partial Differential Equations
Course Outcomes:
Formulate physical problems as PDEs using conservation laws. understand analogies between mathematical descriptions of different (wave) phenomena in physics and engineering. classify PDEs, apply analytical methods, and physically interpret the solutions.

Course Code: 70664; Theory Of Relativity
Course Outcomes:
Proving fundamental properties of mathematical elements and their relationships
Deriving geodesics from a given metric
Deriving metrics from the Einstein field equation for simple forms of the stress-energy tensor
Describing the fundamental properties of gravitational waves.

Course Code: 70665; Biomathematics
Course Outcomes:
Mathematically model, solve, and analyse problems in biomathematics. Implement computational approaches to solve and analyse problems in biomathematics.

Course Code: 70666; Theory of Queues
Course Outcomes:
Understanding the basic theory of Markov processes and how to apply it to model queuing systems
Deriving and using analytic models of Markovian queuing systems, queuing networks, and some simpler non-Markovian systems
Explaining and using results derived for complex non-Markovian systems
Learning the foundations of queueing theory, including basic models, key ideas, and methods

Understanding how to apply queueing theory to model and analyse engineering systems

Course Code: 70667; Theory of Fuzzy Sets and Applications
Course Outcomes:
Introduce the concepts of fuzzy sets and their role in applications of semantic interpreters, control systems and reasoning systems. Apply the concepts of Fuzzy sets in image processing, pattern reorganisation and decision making. Apply the concepts of Fuzzy logic in image processing.

Course Code: 70668; Numerical Solutions of ODE & PDE
Course Outcomes:
Formulate physical problems as PDEs using conservation laws. understand analogies between mathematical descriptions of different (wave) phenomena in physics and engineering. classify PDEs, apply analytical methods, and physically interpret the solutions. Identify the initial value problem for the first order ordinary differential equations. They will also be able to obtain the solution or the initial value problems by using Euler's method. Solve partial differential equations of first and second order, and systems of ODE. They will also be able to find approximate solutions to some first order ODE.

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