

**PG & RESERACH DEPARTMENT OF MATHEMATICSM.Sc.
MATHEMATICS PROGRAMME**

Programme Objectives:

1. To gain sufficient knowledge in almost all branches of mathematics which can be used by the student for further applications in their respective domains of interest.
2. To import skills that are necessary for life-long learning through continuing education, research and professional development.

Programme Outcomes:

- PO 1: To revisit and strengthen fundamental concepts and principles of various areas of mathematics.
- PO 2: To create interest in systematic understanding of the concepts and theories of mathematics and their applications to the real world.
- PO 3: To select, interpret and perceive the signification of information from sources that include books, journals, scientific reports and the internet.
- PO 4: To prepare the students for competitive exams that include CSIR NET, SET etc. and to win a wide range of rewarding positions in the public and private sectors.
- PO 5: To motivate research by developing problem, solving skills and apply them independently to problems in pure and applied mathematics.

Course Code: 20PMS101	Title: ALGEBRA
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Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	recollect the knowledge of groups, ring, homomorphism and automorphism of fields.
K2	CO2	demonstrate on polynomial rings, factorization and ideal theory in the polynomial ring, the structure of primitive polynomials and Galois theory.
K3	CO3	demonstrate on applying Sylow's theorem in subgroups and apply Gauss lemma, Einstein criterion for irreducibility of polynomials over rationals.
K4	CO4	demonstrate on applying different fields, finite fields, extension of fields, splitting field, normal extension, simple extension and fixed field.

Course Code: 20PMS102	Title: REAL ANALYSIS
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Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	attain a broad understanding of analysis techniques that are the basic stepping stones to contemporary research.
K2	CO2	classify sequences of functions which are pointwise convergent and uniform convergent.
K3	CO3	apply the basic results to classical theorems in advanced real analysis.
K4	CO4	understand the concept of Lebesgue measure which is later used in developing the theory of Lebesgue integration that gives stronger results as compared to the theory of Riemann integration.

Course Code: 20PMS103	Title: COMPLEX ANALYSIS
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Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	understand the concepts and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra.
K2	CO2	analyze complex contour integrals in several ways directly using parameterization and using Cauchy's theorem.
K3	CO3	represent functions as Taylor, Power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.
K4	CO4	obtain deep knowledge in advanced topics such as infinite products, canonical products and normal families.

Course Code: 20PMS104	Title: Ordinary Differential Equations
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Course Outcomes (CO)

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

K1	CO1	understand the concept of Linear differential equation, Wronskian and properties
K2	CO2	solve differential equations using power series method
K3	CO3	understand linear System ,fundamental matrix and its properties
K4	CO4	analyse existence, uniqueness, other properties of a solution of differential equations and concepts of boundary value problems

Course Code: 20PMS1E1	Title: MAT LAB
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Course Outcomes (CO)

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

K1	CO1	remember the notion of loops and conditional statements and apply them by modifying the commands with respect to MATLAB.
K2	CO2	get deep knowledge about the basics of MATLAB and can able to create arrays and plots using MATLAB.
K3	CO3	apply the concepts of polynomials, curve fitting and interpolation in MATLAB.
K4	CO4	implement the mathematical operations via arrays using MATLAB.

Course Code: 20PMS1E2	Title: Programming Lab In Matlab
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Course Outcomes (CO)

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

K3	CO1	gain knowledge about the creation of matrices and graphics.
K4	CO2	access the plotting commands in creating and editing 2D and 3D plots.
K5	CO3	evaluate the roots of the polynomial and the best fit of the function.

Course Code: 20PMS205	Title: LINEAR ALGEBRA
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Course Outcomes (CO)

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

K1	CO1	remember the concept which are basic to analysis of a single linear transformation on a finite dimensional vector space.
K2	CO2	understand and get the idea of diagonalizable and nilpotent part of a more general transformation, the rational and Jordan Canonical formula.
K3	CO3	arrive the primary and cyclic decomposition theorems and study of admissible subspaces.
K4	CO4	analyze the concepts of matrices over a polynomial domain and a concept of bilinear forms.

Course Code: 20PMS206	Title: MATHEMATICAL STATISTICS
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Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	construct the probability distribution of a random variable based on a real world situation and use it to compute expectation and variance.
K2	CO2	compute probabilities based on practical situations using the binomial, normal, F and t distributions.
K3	CO3	understand the limiting process of distributions and solve related problems.
K4	CO4	master the syllabus and will be able to read research reports , to do research in this field. It will help the students to face SLET, NET and CSIR examinations.

Course Code: 20PMS207	Title: PARTIAL DIFFERENTIAL EQUATIONS
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Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	recollect the first order and second order partial differential equations and their solution.
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K2	CO2	understand the linear partial differential equations with constant and variable coefficients, Boundary value problems and application of calculus of variations.
K3	CO3	gain good knowledge in applying Charpit's and Jacobi's methods, method of separation of variables and the method of integral transforms obtain solutions of partial differential equations.
K4	CO4	demonstrate on the canonical forms of second order PDEs and bounded value problems by Dirichlet and Neumann.

Course Code: 20PMS208	Title: MECHANICS
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Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	understand the 3N-coordinate system made up of N-spacial coordinates, N-velocity coordinates and N-acceleration coordinates.
K2	CO2	analyse the motion of mechanical systems with constraints using Lagrangian description.
K3	CO3	apply hamilton's principle and gain proficiency in solving equations of motions.
K4	CO4	use the Hamilton-Jacobi theory in solving equations of motions

Course Code: 20PMS209	Title: NUMERICAL ANALYSIS
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Course Outcomes (CO)

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

K1	CO1	understand the use of MATLAB to solve the set of equations and find the numerical solutions for differentiation and integration.
K2	CO2	apply iterative methods to compute the solutions of non-linear equations using MATLAB within a specified tolerance.
K3	CO3	estimate the solutions of ordinary differential equations using various methods numerically.
K4	CO4	analyze the concept of Boundary value problems and Characteristic value problems.

Course Code: 20PMS210	Title: PROGRAMMING LAB IN NUMERICAL ANALYSIS USING MATLAB
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Course Outcomes (CO)

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

K3	CO1	gain knowledge about the intimate relationship between computers and numerical analysis by employing MATLAB to perform the steps of numerical analysis.
K4	CO2	access the various methods to solve a system of linear equations and implement them in finding numerical solutions using MATLAB.
K5	CO3	evaluate the solutions of first order ordinary differential equations numerically using MATLAB.

Course Code: 20PMS2N1	Title: NME - Mathematical Statistics and Techniques
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Course Outcomes (CO)

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

K1	CO1	remember the concepts of Mean, Median and Standard deviation.
K2	CO2	understand the concept of simple and rank correlation.
K3	CO3	acquire the knowledge of Regression Analysis.
K4	CO4	apply the testing of hypothesis to Z test, t-test, chi square and F test.

Course Code: 20PMS2N2	Title: MATHEMATICS IN FINANCE
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Course Outcomes (CO)

On successful completion of the course, the students should be able to

K1	CO1	get the idea of ratio analysis
K2	CO2	implement the concepts of return on investments.
K3	CO3	analyze the basic concepts of financial statement analysis.
K4	CO4	gain the basic knowledge of meaning of capital budgeting.

Course Code: 20PMS311	Title TOPOLOGY
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Course Outcomes (CO)

Upon successful completion of this course, students will be able to

K1	CO1	develop their abstract thinking skills.
K2	CO2	provide precise definitions and appropriate examples and counter examples of fundamental concepts in general topology.
K3	CO3	acquire knowledge about various types of topological spaces and their properties.
K4	CO4	appreciate the beauty of the mathematical results like Uryzohn's Lemma and understand the dynamics of the proof techniques.

Course Code: 20PMS312

Title: FUNCTIONAL ANALYSIS

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	have a clear understanding of Normed linear spaces, Banach spaces, Hilbert spaces and $B(X, Y)$.
K2	CO2	understand some important, but simple to follow theorems such as the best approximation theorems, projection theorem and Riesz representation theorem.
K3	CO3	have full grasp of the three important theorems of functional analysis namely Hahn-Banach theorem, the uniform boundedness principle and the closed graph theorem.
K4	CO4	apply the concepts and results covered in the course to numerical analysis and operator equations.

Course Code: 20PMS313

Title: COMBINATORICS

Course Outcomes (CO)

On successful completion of the course student will be able to

K1	CO1	gain a working knowledge of the basic ideas and techniques of the subject
K2	CO2	handle various aspects of assignment problems, beginning with the famous result of Philip Hall, and its various applications.
K3	CO3	understand the Steiner system $S(5, 8, 24)$ and the construction of Leech Lattice in 24 dimensions..
K4	CO4	have a sound knowledge of block designs and its applications to error correcting codes

Course Code: 20PMS314

Title: GRAPH THEORY

Course Outcomes (CO)

On successful completion of the course student will be able to

K1	CO1	Understand the preliminaries of both undirected graphs and directed graphs.
K2	CO2	visualize the concept of planar graph and connectivity.

K3	CO3	Apply the concept of Eulerian graph and Hamiltonian graph.
K4	CO4	analyze both vertex colouring and edge colouring as well as matchings in graphs.

Course Code: 20PMS3E3	Title: LATEX
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Course Outcomes (CO)

On successful completion of the course the students will be able to

K1	CO1	know the basic features of LATEX system.
K2	CO2	prepare their own document in different environments.
K3	CO3	understand how to type set mathematics symbols such as roots, arrows, Greek letters and complex math structures such as functions, stacked expressions, matrices, lists of figures and tables.
K4	CO4	become a self-learner and begin investigating and learning new LATEX packages on their own.

Course Code: 20PMS3E4	Title: PROGRAMMING LAB IN LATEX
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Course Outcomes (CO)

On successful completion of the course the students will be able to

K3	CO1	build their confidence to work in Latex.
K4	CO2	understand section hierarchy and cross reference of book environment in Latex.
K5	CO3	draw various types of pictures by accessing Latex draw.

Course Code: 20PMS415	Title: FLUID DYNAMICS
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Course Outcomes (CO)

On completion of the course the students will be able to

K1	CO1	understand the fundamental equation of viscous compressible fluid
K2	CO2	get an idea about Bernoulli equation, Momentum theorems and their various applications
K3	CO3	analyze the motion of solid bodies in fluid
K4	CO4	create a sound knowledge of boundary layer theory

Course Code: 20PMS416	Title: OPERATOR THEORY
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Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	understand the concepts of Dual space, Reflexivity, weak convergence and compact operators and to illustrate them with examples.
K2	CO2	have a clear understanding of Spectrum, Resolvent set of an operator and Spectral mapping theorem.

K3	CO3	have well founded knowledge in adjoint of an operator, self adjoint operator, normal and unitary operator and their properties.
K4	CO4	apply the concepts and results covered in the course to operator equations.

Course Code: 20PMS417

Title: CONTROL THEORY

Course Outcomes (CO)

On successful completion of this paper, the students will be able to

K1	CO1	develop their knowledge in the basic problems namely, observability, controllability, stability, stabilizability and optimal control.
K2	CO2	differentiate and solve the problems in linear systems and non-linear systems.
K3	CO3	find the rank of matrices by using the concepts of observability and controllability.
K4	CO4	easily understand the linear time varying system and linear time invariant system.

Course Code: 20PMS4E5

Title: MATHEMATICAL
METHODS

Course Outcomes (CO)

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

K1	CO1	provide a practical working knowledge of mathematics.
K2	CO2	derive some classical differential equations by using principles of calculus of variations.
K3	CO3	solve volterra integral equations and Fredholm integral equations.
K4	CO4	acquire the mathematical skills required to solve problems arising in daily life.