DEPARTMENT OF MATHEMATICS & STATISTICS
KGC HARDWAR

M.SC. MATHEMATICS

PROGRAMME OUTCOMES

PO1 : Caters the need of academicians at post graduate, graduate and senior secondary levels apart from the researchers in the field of pure and applied mathematics.

PO2 : Cultivates interest of students in problem solving aptitude to produce accurate, efficient and flexible problem solvers to handle day to day and long term problems at various levels viz. local, national and global.

PO3 : Imparts the skills of problem analysis, model formulation, evaluation, validation and implementation of solution.

PROGRAMME SPECIFIC OUTCOMES

PSO1 : Development of mathematical and logical reasoning.

PSO2 : Good understanding of concepts in various courses of pure and applied mathematics.

PSO3 : Imparting knowledge of courses like mathematical modelling, fuzzy logic, Fourier analysis and wavelet theory etc., that is of utmost significance due to its contribution towards modern era research and industrial needs.

PSO4 : Apply the knowledge of various mathematical techniques and tools to solve real life problems.

PSO5 : Development of programming skills using C++ and its application in solution of scientific and real life problems.

PSO6 : Provide updated knowledge on topics of Applied Mathematics, empowering students to pursue higher studies at Institutes of repute.

PSO7 : Guidance for preparation of various competitive examinations namely NET, GATE, SLET etc.

COURSE OUTCOMES

MMA-C101: COMPLEX ANALYSIS

CO1: Understanding of continuity and differentiability of complex functions, C-R equations, Harmonic Functions.

CO2: Evaluation of complex integration, Cauchy's Integral formula, Poisson's integral formulae.

CO3: Power series, zeroes, singularity and introductory conformal mapping.

CO4: Concept of residues, Cauchy's Residue Theorem and its application in evaluation of real definite integral.

MMA-C102: DIFFERENTIAL EQUATIONS

CO1: Understanding the concepts of existence and uniqueness of solution of differential equations, some techniques to solve linear equations with variable coefificients and their applications to vibrational mechanical system, solution of boundary value problems.

CO2: Power series solution of first and second order linear differential equations, Legendre and Bessel functions and their recursion formulae.

CO3: Solution of linear and non-linear partial differential equation of first order.

CO4: Solutions of linear partial differential equation of second order with constant and variable coefficient.

MMA-C103: DISCRETE MATHEMATICS

CO1: Elaborate mathematical structures that are fundamentally discrete.

CO2: Formulate and Interprets statements presented in Boolean logic, reformulate statements from common language to formal logic. Apply truth tables and rules of propositional and predicate calculus.

CO3: Explain Boolean algebra, POSET, lattices as algebraic system.

CO4: Describe finite state machine, finite state automata, language & grammar.

CO5: Explain historical perspective of development of modern discrete mathematics.

MMA-C104: ABSTRACT ALGEBRA

CO1 : Understanding the concepts of abstract mathematics, normal subgroups, finite groups, class equation of a group and its consequences.

CO2 : Identification and comparison of properties of rings, integral domains, Euclidean rings, ideals principal ideal domains, modules and fields.

CO3 : Concept of homomorphism in groups and modules.

CO4 : Understanding relationships among polynomial rings, roots of polynomials and extension fields.

CO5 : Concept of fixed field, Galois group of a polynomial over a field and constructible numbers.

MMA-C201: TOPOLOGY

CO1: Demonstrate the understanding of concepts metric spaces and topological spaces, and their role in mathematics.

CO2: Describe basic results about completeness, compactness, connectedness, continuity and convergence within these structures.

CO3: Explain first and second countable space, Housdorff spaces, regular spaces, normal spaces, Completely Normal Spaces.

CO4: Describe fundamental group function, homotopy of maps between topological spaces.

MMA-C202: PROBABILITY THEORY & STATISTICS

CO1: Describe probability (open-ended elementary problems), moments, expectation.

CO2: Solve basic problems in probability theory including problems involving the Binomial, Poisson, Geometric, Exponential and Normal distributions.

CO3: Estimate basic population parameters. Construct and interpret confidence intervals to estimate means & proportions for population.

CO4: Preform basic hypothesis tests.

CO5: Explain regression and curve fitting.

MMA-C203: MATHEMATICAL METHODS

CO1: Understanding the concept of integral equations, techniques to solve linear integral equations of first and second kind of Fredholm and Volterra types and solution of equations with separable kernels.

CO2: Understanding the concept of functional and its variation, Euler's equation, some special cases of Euler's equation.

CO3: Understanding the concept of Laplace transform and its application in solving ordinary and partial differential equations.

CO4: Understanding Z-transform, shifting and convolution theorems and solution of difference equation using Z-transform.

MMA-C204: OPERATIONS RESEARCH

CO1: Describe definitions and scope of operations research.

CO2: Classify different O.R. models. Describe general methods for solution of O.R. models and phases of O.R. study.

CO3: Formulate real world problems as a linear programming problem and demonstrate the solution by simplex method.

CO4: Understanding of inventory management and development of mathematical models to analyse and optimise various types of inventory control systems.

CO5: Determine the optimal sequence of n jobs on m machines and two jobs on m machines so that total elapsed time is minimum.

CO6: Describe the concept of convex functions, K-T conditions and solution of quadratic programming problem.

CO7: Classify the queuing systems and analyse Poisson queues.

CO8: Apply the concepts of game theory to real world competitive situations to find out best strategy to optimize gains/losses and solution methods for two person zero sum game problems.

CO9: Determine the best replacement policy of items that deteriorate gradually or fail suddenly.

MMA-C301: FUNCTIONAL ANALYSIS

CO1: Describe the transformation of function along with their algebraic and topological properties.

CO2: Explain normed Space, Banach Space, compactness and finite dimension.

CO3: Endow linear algebra with concepts from topology (inner product space, including principle of uniform boundedness, Hahn-Banach theorem, open mapping theorem, closed graph theorem.

CO4: Apply Banach fixed point theorem to solve integral and ordinary differential equations.

MMA-C302: MEASURE THEORY

CO1: Understanding the concepts of cardinal numbers, arithmetic operations on cardinal numbers and Canter like sets.

CO2: Describe Lebesgue measure, measurable sets, Borel sets and non-measurable sets.

CO3: Describe measurable functions and their properties, step functions, simple functions, convergence of sequence of functions, convergence in measure.

CO4: Concept of Lebesgue integral of a bounded function, non-negative measurable functions and measurable functions, relation between Lebesgue and Riemann integrals, convergence theorems on sequence of integrals such as bounded convergence theorem, Fatou's Lemma, Monotone convergence theorem and Lebesgue dominated convergence theorem.

CO5: Understanding of functions of bounded variation, differentiation of an integral, L_P space, Holder's inequalities and Minkowski inequality.

MMA-E301: PROGRAMMING IN C++

CO1: Understanding the basic concepts of computers and writing algorithms for problem solving.

CO2: Describe basic concepts of structured programming paradigm.

CO3: Describe concepts of object oriented programming paradigm such as objects, classes, operator overloading, inheritance and writing computer programs on these concepts in C++ language.

CO4: Describe usage of virtual, friend and static functions and memory management.

MMA-E351: PROGRAMMING IN C++ LAB

CO1: Practice and implement various concepts of object oriented programming approach by writing programs of various problems.

MMA-E302: GRAPH THEORY

CO1: Classify graphs, walks, paths, circuits, Euler graphs, unicursal graphs, digraphs and its types.

CO2: Describe concepts of trees and its properties, spanning trees, counting labelled and unlabelled trees and their applications to real world problems.

CO3: Understanding the concepts of cutsets, connectivity and separability, isomorphism, planar graph, detection of planarity, geometric dual and combinatorial dual.

CO4: Concepts of modular arithmetic and Galois fields, incidence matrix, circuit matrix, path matrix, cutset matrix and adjacency matrix.

CO5: Understanding of chromatic number, chromatic polynomial, coloring, matching and covering.

MMA-E303: NUMBER THEORY

CO1: Describe unique factorisation theorem, Farey series.

CO2: Understanding proof of Fermat's theorem, Wilson's theorem, Hurwitz theorem

CO3: Understanding fundamentals of arithmetic in K(i), K(I) and quadratic fields.

CO4: Find elementary results of order and average order of arithmetic functions Mu, Tau, Phi and Sigma.

MMA-E304: NEURAL NETWORKS

CO1: Describe the role of neural networks in engineering, artificial intelligence, and cognitive modeling.

CO2: Design single-layer feed-forward neural networks for practical applications.

CO3: Design multi-layer feed-forward neural networks for practical applications.

CO4: Design single-layer feedback neural networks for practical applications.

CO5: Analyse matching and self-organising networks for practical applications.

MMA-C401: NUMERICAL ANALYSIS

CO1: Obtain numerical solution of algebraic and transcendental equation by using various numerical methods and convergence analysis.

CO2: Describe various methods of interpolation with evenly spaced and unevenly spaced data.

CO3: Describe methods of solutions of linear simultaneous equations, numerical differentiation and integration with error analysis.

CO4: Describe various methods for numerical solutions of initial value problems and boundary value problems.

MMA-C451: NUMERICAL ANALYSIS LAB

CO1: Practice and implement the knowledge of programming to solve problems of numerical analysis by writing programs in C++.

MMA-C402: MATHEMATICAL MODELLING

CO1: Understanding the constructions of models, characteristics of mathematical models, linear growth and decay models.

CO2: Describe mathematical modelling of epidemic model, compartment models through system of ordinary linear equations.

CO3: Understanding economics based model(debt and investment models), mathematical models in medicines and mathematical modelling through difference equations.

CO4: Describe concept of equation of continuity in fluid flow (Euler's and Lagranges forms) and Euler's equation of motion.

CO5: Classify air pollution models and models for blood flow.

MMA-E401: FUZZY SETS AND THEIR APPLICATIONS

CO1: Understanding the concept of fuzzy sets and their representation, α-cuts, decomposition theorem, extension principle for fuzzy sets.

CO2: Understanding concepts of fuzzy compliments, fuzzy intersection(T-norms), fuzzy unions (T-conorms)

CO3: Understanding concepts of fuzzy numbers, arithmetic operations on fuzzy numbers and fuzzy equations.

CO4: Describe concepts of crisp and fuzzy relations, binary fuzzy relations, fuzzy equivalence relations, max–min composition, fuzzy ordering relation, fuzzy morphism.

CO5: Solution of fuzzy relation equations, fuzzy logic, fuzzy decision making, fuzzy linear programming, fuzzy regression with fuzzy data.

MMA-E402: FOURIER ANALYSIS AND WAVELET THEORY

CO1: Describe the basics of Fourier analysis, absolute and uniform convergence, integration & differentiation of Fourier series.

CO2: Underatanding concept of Fourier transform, wavelets, continuous wavelet transforms, its basics properties and discrete wavelet transform.

CO3: Describe multiresolution analysis, scaling functions and orthonormal wavelet bases, Daubechies wavelets.

MMA-E403: FLUID DYNAMICS

CO1: Classify the concepts of Lagrangian and Eulerian forms of equation of motion of fluid, continuity of mass flow, irrotational and rotational flows, boundary surface.

CO2: Describe Euler's Equation, Bernoulli's Theorem (Compressible and Incompressible flows) and Kelvin's theorem..

CO3: Obtain solution of two-dimensional and three-dimensional irrotational motion. Understanding of potential flow due to sources, sinks and doublets stroke stream functions.

CO4: Derivation of Navier- Stokes equations, dissipation of energy, steady parallel flow between two infinite parallel plates and flow through a circular pipe.

MMA-E404: CRYPTOGRAPHY AND NETWORK SECURITY

CO1: Describe fundamentals of cryptography and its applications to network security.

CO2: Elaborate background on hash functions, authentication, firewalls, intrusion detection techniques.

CO3: Describe network security.

MMA-E405: DISSERTATION

CO1: Inculcate a taste of research in Mathematics or allied fields.

CO2: Develop oral and written presentation skills.