Department of Mathematics
Govt. Autonomous College, Rourkela

PROGRAMME OUTCOMES

PO1: Inculcate critical thinking to carry out scientific investigation objectively without being biased with preconceived notions.
PO2: Equip the student with skills to analyze problems, formulate an hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.

PO3: Prepare students for pursuing research or careers in industry in mathematical sciences and allied fields.

PO4: Continue to acquire relevant knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematical sciences.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Demonstrate basic manipulative skills in algebra, geometry, trigonometry, and beginning calculus.
PSO2: Communicate mathematical ideas both orally and in writing
PSO3: Investigate and solve unfamiliar math problems
PSO4: Understanding of the fundamental axioms in mathematics and capability of developing ideas based on them.
PSO5: Prepare and motivate students for research studies in mathematics and related fields.
PSO6: Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains.
PSO7: Provide advanced knowledge on topics in pure mathematics, empowering the students to pursue higher degrees at reputed academic institutions.
PSO8: Strong foundation on algebraic topology and representation theory which have strong links and application in theoretical physics, in particular string theory.
PSO9: Good understanding of number theory which can be used in modern online cryptographic technologies.
PSO10: Nurture problem solving skills, thinking, creativity through assignments, project works.

COURSE OUTCOMES

B.Sc. MATHEMATICS

SEMESTER I:

Core 1: CALCULUS: Hyperbolic function, Higher order derivative, Riemann Integration, Volume by slicing, vector triple product.

Core 2: DISCRETE MATHEMATICS: Set relation function, Equivalence relations, Principle of Mathematical Induction, Matrices, Graph Theory.

SEMESTER II:

Core 3: REAL ANALYSIS: Review of algebraic and order properties, sequence, limit , differentiability.

Core 4: DIFFERENTIAL EQUATIONS: Differential equation and mathematical Model, Compartmental model, Homogeneous equations, equilibrium point, battle model and its analysis.

SEMESTER III:

Core 5: THEORY OF REAL FUNCTIONS: L' Hospital's rules, Taylor's theorem, Riemann Integration improper integral, series of function.

Core 6: GROUP THEORY – I : Symmetry of a square, Group, Subgroup, Normal subgroup , factor group, Cauchy theorem, Homomorphism, Isomorphism .

Core 7: PARTIAL DIFFERNTIAL EQUATIONS AND SYSTEM OF ODEs: Basic concepts and geometrical interpretation, heat equation, wave equation, Laplace equation, Cauchy Problem, System of linear differential equations.

SEMESTER IV:

Core 8: NUMERICAL METHODS AND SCIENTIFIC COMPUTING: Rate of convergence, Error, system of algebraic equation, interpolation, numerical integration.

Core 9: TOPOLOGY OF METRIC SPACES: Metric spaces, subspaces, continuity, contraction mapping and its application.

Core 10: RING THEORY: Ring, subrings, prime and maximal ideals, polynomial ring, divisibility of integral domain, field, ring homomorphism, isomorphism.

SEMESTER V:

Core 11: MULTIVARIATE CALCULUS: Function of several variables, Limit and continuity, extrema of function, triple integral, line integral, Green's Theorem, Divergence Theorem, Stoke's Theorem.

Core 12: LINEAR ALGEBRA: Vector space, subspace, linear transformation, matrix representation, eigen space, orthogonal complement.

DSE – 1: LINEAR PROGRAMMING: Introduction to LPP, Simplex method, Two phase method, Big M method, transportation problem , assignment problem, game theory.

DSE – 2: PROBABILITY AND STATISTICS: Sample space, events, Probability distributions, mathematical expectation, special probability distribution, sampling distribution.

SEMESTER VI:

Core 13: COMPLEX ANALYSIS: complex numbers and complex plane, Cauchy theorem and its applications, Morera's Theorem, Meromorphic function, Evaluation of integrals by method of residues.

Core 14: GROUP THEORY – II: Automorphism, Commutator subgroup, Group action, Sylow's Theorem, Class equations .

DSE – 3: DIFFERENTIAL GEOMETRY: Theory of space curves, evolutes and involutes of curves, principle and Gaussian curvature, Geodesics, Canonical Geodesics equations.

DSE – 4: PROJECT: Students will be able to understand project characteristics and its various stages from topics of mathematics.

M.Sc. MATHEMATICS

SEMESTER-I:

MAT 101: ADVANCED ABSTRACT ALGEBRA: Groups, Isomorphism theorem, Butterfly lemma, normal series Subgroup Jordan- Holder Theorem Field theory, Modulo, cyclic modulo, galious theory.

MAT 102: REAL ANALYSIS: Riemann Stieltjes Integral, Sequence and series function, Convergence and Continuity, Lebesgue measure, Differentiation and integration, Basnach Space, LP space Bounded linear function.

MAT 103: ADVANCED DIFFERENTIAL EQUATION : existence of uniqueness gromwell inequality, existence and uniqueness theorem, linear system, non linear diff. Equation monotonic iterative Picard's Theorem Laplace equation mean value formula, wave equation solution.

MAT 104: OPERATION RESEARCH: Convex set, linear programming, duality in LPP transportation problem, assignment problem, upper bounding technique, Dynamic Programming, Game theory

MAT 105: PRACTICAL: (On Advanced Differential Equation)

SEMESTER-II:

MAT 201: COMPLEX ANALYSIS: Complex function, complex integration, fundamental theorem of algebra, Cauchy's Theorem, Analytic Function, Gourset theorem, moreras theorem, maximum modulo theorem, Schwartz Lemma.

MAT 202 : TOPOLOGY : Topological space, basic and order of topology , close set, limit points, continuous function homomorphism, connected space, compact space, accountability, separation axiom, product space,

MAT 203: PROGRAMMING IN C: Overview of C, Constant, variable, data type, Operator, Decision making, branching looping, Arrays, user define function, Stricture, Union.

MAT 204: LINEAR ALGEBRA: Linear transformation, matrix space, Eigen value and Eigen vector, Determinant, inverse of matrix, Clayey Hamilton theorem, Diagonality, inner product vector space, vector product, norm of vector, Cauchy-Schwartz theorem.

MAT 205: PRACTICAL: (On Programming in C)

SEMESTER-III :

MAT 301: PROBABILITY AND STOCHASTIC PROCESS: Random variable, covariance, correlation, moments, normal distribution, chi-square, t and f distribution, stochastic process.

MAT 302: DIFFERENTIAL GEOMETRY: theory of curves, rules surface, developable surface, metric of a surface, orthogonality, normal curvature, principal direction and principal curvature, asymptotic line

MAT 303 : GRAPH THEORY : Path and circuit, tree, fundamental circuit, Cut set, cut vertices, planar and dual graph, matrix representation of graph, colouring, directed graph.

MAT 304: PROGRAMMING IN C++: Principle of OOP, Application of OOP, Stricture of C++, Function in C++ , Class, Construction and destruction, Operator overloading,

MAT 305: SEMINAR, LITERATURE REVIEW & STUDY TOUR:

MAT306: PRACTICAL: (On Programming in C++)

SEMESTER-IV:

MAT 401: OPTAMIZATION THEORY: One dimensional optimization, Gradient Based Optimization, calculus of R^n , Method of steepest descent, conjugate gradient method,

MAT 402: FUNCTIONAL ANALYSIS: Metric Space, Open set, Closed set, neighbourhood, convergence, Banach Space, finite dimensional linear operator, Hilbert space, Orthogonal set, Zorn's lemma, Joint operator

MAT 403: NUMERICAL ANALYSIS : Approximation of functions, Numerical solution , system of linear equation Residual, correction method, Error analysis, composite integration method, Eigen value location error and stability result, hermit interpolation

MAT 404: OPERATOR THEORY: special theory in dimensional normal space, banach algebra, complex homomorphism, commutative banach space, compact linear operator on mad space, giefand transform

MAT 405: PROJECT /DISSERTATION: Project on advanced topics on Mathematics.

MAT 406: PRACTICAL: (On Numerical Analysis)