

DUTIKA SAHU COLLEGE, LAIDA SAMBALPUR

DEPARTMENT OF MATHEMATICS

PROGRAM OUTCOME OF B.SC. (MATHEMATICS)

PO-1	Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
PO-2	A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
PO-3	Will have the ability to identify the problems and define the computing requirements, which may be appropriate to its solution.
PO-4	A fundamental as well as a higher level of understanding, compression, analysis and articulation of concept studied.
PO-5	Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
PO-6	Ability to pursue advanced studies and research in pure and applied mathematical science.

PROGRAM SPECIFIC OUTCOMES OF B.SC. (MATHEMATICS)

PSO-1	Understanding of the fundamental axioms in mathematics and capability of developing ideas based on them.
PSO-2	Inculcate mathematical reasoning.
PSO-3	Provide knowledge of mathematical techniques and application of mathematical methods.
PSO-4	Nurture problem solving skills, thinking, creativity
PSO-5	Assist students in preparing (personal guidance, books) for competitive exams for higher studies e.g., JAM, CPET

COURSE OUTCOMES OF B.SC. (MATHEMATICS)

SEMESTER	PAPER CODE	SUBJECT	CREDITS
I	CORE-I	CALCULUS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	After completing the calculus students are able to use Leibnitz's rule to evaluate derivatives of higher order.	
CO-2	Able to study the geometry of various types of functions.	
CO-3	Able to evaluate the volumes of solids using techniques of integration.	
CO-4	Able to calculate the length of an arc of a curve whose equations are given in parametric and polar form.	
CO-5	Understand the basic concept of conics, rotation of axes and classification of conics and polar equations of conics.	
CO-6	Able to identify the difference between scalar and vector and acquired knowledge on some the basic properties of vector functions	
CO-7	After completing the course students are expected to be apply knowledge of calculus in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
I	CORE-II	DISCRETE MATHEMATICS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	To understand logical concepts and to show logical equivalences by using truth tables and rules in logics.	
CO-2	Understand the results involving divisibility and greatest common divisors and solve systems of linear congruences.	
CO-3	Learn concept related to counting and advanced counting.	
CO-4	Use computational techniques and algebraic skills essential for the study of systems of Linear equations.	
CO-5	Evaluate the Eigen values and Eigen Vectors of the matrix.	
CO-6	Assimilate various graph theoretic concepts and familiarize with their applications	
CO-7	After completing the course students are expected to be apply knowledge of Discrete Mathematics in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
I	GE-I	CALCULUS AND DIFFERENTIAL EQUATIONS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Able to trace different types of curves, calculate the length of arcs of a curve whose equation is given and find the asymptotes of curve.	
CO-2	Understand the concept of derivatives and able to apply it and also able to use L'Hospital rule and series expansion.	
CO-3	Able to understand the concept of limit and continuity, partial derivatives and its applications.	
CO-4	To understand the concept of differential equation and familiarizes with their form and able to solve.	
CO-5	After completing the course students are expected to be apply knowledge of calculus and differential equations in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
II	CORE-III	REAL ANALYSIS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Understand many properties of the real line $\mathbb{R}$.	
CO-2	Learn to define sequence in terms of functions from $\mathbb{R}$ to a subset of $\mathbb{R}$.	
CO-3	Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence	
CO-4	Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.	
CO-5	Understands limits and their use in sequences, series, differentiation.	
CO-6	Understand the consequences of various mean value theorems for differentiable functions	
CO-7	After completing the course students are expected to be apply knowledge of Real Analysis in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
II	CORE-IV	DIFFERENTIAL EQUATIONS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	A student completing the Differential Equation is able to solve differential equations and is able to model problems in nature using Ordinary Differential equations.	
CO-2	This is also prerequisite for studying the course in Partial Differential equations and models dealing with Partial Differential Equations.	
CO-3	Able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.	
CO-4	Gain the idea of equilibrium points and interpretation of phase plane.	
CO-5	After completing the course students are expected to be apply knowledge of Differential Equations in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
II	GE-II	CALCULUS AND DIFFERENTIAL EQUATIONS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Able to trace different types of curves, calculate the length of arcs of a curve whose equation is given and find the asymptotes of curve.	
CO-2	Understand the concept of derivatives and able to apply it and also able to use L'Hospital rule and series expansion.	
CO-3	Able to understand the concept of limit and continuity, partial derivatives and its applications.	
CO-4	To understand the concept of differential equation and familiarizes with their form and able to solve.	
CO-5	After completing the course students are expected to be apply knowledge of calculus and differential equations in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
III	CORE-V	THEORY OF REAL FUNCTIONS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Gain knowledge on indeterminate form and Use of L'Hospital rule	
CO-2	Able to solve problems involving derivative and its application Geometrical representation and problem solving on MVT and Rolle's theorem.	
CO-3	Able to understand continuity of functions and its properties, uniform continuity, differentiability of functions, algebra of functions, Taylor's Theorem and its applications.	
CO-4	Gain knowledge on Riemann Integral and its properties in detail, leading to fundamental theorem of calculus and Mean value theorems.	
CO-5	Able to test convergence of improper integrals of first and second kind.	
CO-6	Understand the concept of pointwise and uniform convergence of sequences and series of functions.	
CO-7	Able to test of uniform convergence of sequence and series, understand integrability and theorems on integrability.	
CO-8	After completing the course students are expected to be apply knowledge of Theory of Real Functions in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
III	CORE-VI	GROUP THEORY-I	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Gain knowledge of elementary properties of Groups.	
CO-2	understands cyclic groups, permutation groups, normal subgroups and related results	
CO-3	Evaluate the order of an element of the group and order of the permutation	
CO-4	Apply the Lagrange's Theorem to check the given subset is a subgroup of a group or not.	
CO-5	Understand group homomorphism & Isomorphism and related theorem	
CO-6	After completing the course students are expected to be apply knowledge of Group Theory in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
III	CORE-VII	PARTIAL DIFFERENTIAL EQUATION AND SYSTEM OF ODEs	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Understand concept of Partial differential equations and classification, solution by Lagrange's method and Charpit's method.	
CO-2	Able to solve wave and heat equations.	
CO-3	Gain knowledge about Classification of second order linear equations as hyperbolic, parabolic or elliptic.	
CO-4	Able to solve homogeneous linear systems with constant coefficients.	
CO-5	After completing PDEs & Systems of ODEs, a student will be able to take more courses on wave equation, heat equation, diffusion equation, nonlinear equations etc.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
III	GE-III	ALGEBRA	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Able to understand relation, ordering, logical concepts and show logical equivalence by using truth tables, logical arguments.	
CO-2	Understand the results involving divisibility and greatest common divisors.	
CO-3	Understand the concepts of minor, cofactor, rank, nullity of matrices, system of linear equations, row reduction and Echlon's form.	
CO-4	Evaluate the eigen values and eigen vectors.	
CO-5	After completing the course students are expected to be apply knowledge of Algebra in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
IV	CORE-VIII	NUMERICAL METHODS AND SCIENTIFIC COMPUTING	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	The problems which cannot be solved by usual formulae and methods can be solved approximately by using numerical techniques	
CO-2	Gain knowledge of fitting curve to the data by using different methods of interpolation as well as extrapolation	
CO-3	Able to determine approximate value of an integral using Simpson's and Trapezoidal rule.	
CO-4	Able to find approximate solution of difficult differential equation using numerical technique.	
CO-5	After completing the course students can handle physical problems to find the approximated solutions. After getting trained a student can opt for the advance courses in Numerical Analysis in higher mathematics and can apply in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
IV	CORE-IX	TOPOLOGY OF METRIC SPACES	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Understand of basic mathematical tools such as open & closed sets, continuity, in metric space.	
CO-2	Gain knowledge of the notion of distance, convergent sequence and continuity of functions.	
CO-3	Gain the idea of Countability and Separability.	
CO-4	Understand Contraction mappings and Applications.	
CO-5	Understand the concept of connectedness, Local connectedness, Bounded sets and compactness, other characterization of compactness	
CO-6	on successful completion of the Topology of Metric Spaces students will learn to work with abstract topological spaces. This a foundation course for all analysis courses in future.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
IV	CORE-X	RING THEORY	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Able to define ring and subrings.	
CO-2	Gain knowledge of ideals and concept related to ideal.	
CO-3	Able to identify an ideal is a prime ideal or maximal ideal.	
CO-4	Gain knowledge of polynomial ring over commutative ring.	
CO-5	Understand integral domain and related properties.	
CO-6	After completing this course this will help students to continue more courses in advanced Ring Theory modules, Galois groups.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
IV	GE-IV	ALGEBRA	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Able to understand relation, ordering, logical concepts and show logical equivalence by using truth tables, logical arguments.	
CO-2	Understand the results involving divisibility and greatest common divisors.	
CO-3	Understand the concepts of minor, cofactor, rank, nullity of matrices, system of linear equations, row reduction and Echlon's form.	
CO-4	Evaluate the eigen values and eigen vectors.	
CO-5	After completing the course students are expected to be apply knowledge of Algebra in the areas of their own interest.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
IV	SECC-II	QUANTITATIVE APTITUDE AND LOGICAL THINKING	4

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Demonstrate the ability to understand and communicate the mathematical principles and to follow the extended line of formal reasoning.	
CO-2	A student who is competent in Quantitative Reasoning is able to read and identify mathematical information that is relevant to a problem.	

CO-3	After completion it will help the students for competitive exams like Banking, SSC, OPSC, UPSC, OSSSC etc.	
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SEMESTER	PAPER CODE	SUBJECT	CREDITS
V	CORE-XI	MULTIVARIABLE CALCULUS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Study functions and several variables.	
CO-2	Study the notion of Continuity and Differentiability of multivariate functions.	
CO-3	Able find extreme values of multivariable Functions using derivatives.	
CO-4	Able to calculate double and triple integration and line integral.	
CO-5	Gain knowledge of basic vector calculus including Green's theorem, Divergence theorem and Stokes theorem.	
CO-6	After completion the Multivariable Calculus a student will able to calculate partial derivatives, directional derivatives, extremum values and can calculate double, triple and line integrals.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
V	CORE-XII	LINEAR ALGEBRA	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Understand the basic concepts of vector space and subspaces.	
CO-2	Able to test a given set of vectors is a basis or not.	
CO-3	Calculate the dimension of a vector space	
CO-4	Understand the basic concept of Linear transformations, null space, range, rank and nullity of a linear transformation.	
CO-5	Able to find out rank and nullity of a matrix linear of transformation.	
CO-6	Gain knowledge of properties of inner product spaces and determine orthogonality in inner product spaces.	
CO-7	Construct the orthonormal basis using Gram Schmidt Orthogonalization process	
CO-8	Able to determine minimal solutions to Systems of linear equations	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
V	DSE-I	LINEAR PROGRAMMING	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Able to Solve the LPP using Simplex method.	
CO-2	Evaluate minimization problem using Big 'M' Method and formulate the dual problem from primal.	
CO-3	Formulate a dual problem and solve it.	
CO-4	Able to Solve the LPP using Two phase method, Dual Simplex Method.	
CO-5	Gain knowledge about Transportation Problems, Assignment Problems and their applications.	
CO-6	Know the application of linear Programming method in Game Theory	
CO-7	After completion of this course this helps the students to deal industrial models. This is also prerequisite for studying advance courses in NLPP.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
V	DSE-II	PROBABILITY AND STATISTICS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Understand the basic principles of probability including probability of events, rules of probability, conditional probability, independent events, Bayes theorem and use these principles in problem solving situations.	
CO-2	Understand the definitions of discrete, continuous, and joint random variables, compute the mean, variance and covariance of random variable.	
CO-3	Know the definition of density and distribution Function of a random variable and be able to find one from the other.	
CO-4	Able to define the binomial, uniform, Poisson, negative binomial, hypergeometric, exponential, Gamma, Beta and normal random variables, know their probability density and distribution functions, compute the mean and variance of these random variables, and use the normal and Poisson distributions to approximate binomial probabilities.	
CO-5	Able to evaluate Moment-generating Function.	
CO-6	Gain knowledge of sampling distribution of mean, Central Limit theorem, Sampling distribution of the mean: finite populations, chi-square, t, F distributions.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
VI	CORE-XIII	COMPLEX ANALYSIS	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Compute sums, products, quotients, conjugate, modulus, and argument of complex numbers.	
CO-2	Define and analyze limits and continuity for complex functions as well as consequences of continuity.	
CO-3	Able to determine a given function is analytic or not.	
CO-4	Understand the basic methods of complex integration and application in contour integration and evaluation of integral using Cauchy's Theorem & Cauchy's Integral Formula.	
CO-5	Able to evaluate contour integral using residue formula.	
CO-6	After completion of this course the students will be able to handle certain integrals not evaluated earlier and will know a technique for counting the zeros of polynomials. This course is prerequisite to many other advance analysis courses.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
VI	CORE-XIV	Group-theory-II	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Understand basic concept of Automorphism, inner automorphism, automorphism groups, automorphism groups of finite and infinite cyclic groups.	
CO-2	Gain knowledge of Commutator subgroup and its properties.	
CO-3	Get idea of direct products, group actions, class Equations.	
CO-4	Know Sylow's theorems and consequences	
CO-5	Know Cauchy Theorem and its application	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
VI	DSE-III	DIFFERENTIAL GEOMETRY	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Understand of basic terms, tangent, principal Normal, binormal, curvature & torsion.	
CO-2	Able to find curvature and torsion using Serret-Frenet formula.	
CO-3	Able to derive equation of involute and evolute of a curve.	
CO-4	Calculate E, F, G; L, M, N and write first fundamental and second fundamental form.	
CO-5	Gain knowledge on lines of curvature, Asymptotic line, developable surface, minimal surface.	
CO-6	Gain basic knowledge on geodesic and related properties.	

SEMESTER	PAPER CODE	SUBJECT	CREDITS
VI	DSE-IV	PROJECT	6

CO NO.	CO-STATEMENT On successful completion of this course, students will able to;	
CO-1	Gain the knowledge of surfing material related to the minor project topic and get idea how to write dissertation and able to speak before a group of people on topic as they have to present seminar before their friends and teachers during the pursue of the project which is the pre-step to do major project in M.Sc. level.	
CO-2	Writing dissertation, they get involve more precisely with the subject which helps them in future to take challenge in life.	

