2019-2020

Dharmabad Shikshan Sanstha's
Lal Bahadur Shastri Mahavidyalaya,Dharmabad-431809

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc FY Sem-I **Subject: Mathematics** **Course Code: CCM-1 Section A**
Paper Title: Calculus-I (Differential Calculus) **Paper No.: I**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Differentiation	Derivability and derivative, derived function, derivability implying continuity, geometrical interpretation of a derivative, derivatives of hyperbolic functions, derivatives of inverse hyperbolic functions, Higher order derivatives, calculation of the nth derivative, determination of n^{th} derivative of rational functions, nth derivatives of the products of the powers of sines and cosines, Leibnitz theorem.	Student will be able To understand conceptof limit, continuity, derivative of single variable functions. Student can find the higher order derivatives of product of functions.
2	Expansion of functions, Tangents and Normals	Maclaurin's theorem, Taylor's theorem, Equations of the tangent and normal, Angle of intersection of two curves, length of the tangent, normal, sub-tangent, sub-normal, pedal equations.	Student can expand functions in terms of infinite series. Student can find equation of tangent, normal and length of tangent, normal and are able to solve examples based on this..
3	Mean Value Theorems	Rolle's Theorem, Lagrange's mean value theorem, Meaning of sign of derivative, Graphs of hyperbolic functions, Cauchy's mean value theorem, Generalized mean value theorems (Taylor's theorem, Maclaurin's theorem).	Student understands the concept of Mean Value Theorems. Student can use the results to solve the examples.
4	Partial Differentiations	Introduction, Functions of two variables, Neighborhood of a point (a,b), Limit and Continuity, Partial derivatives, Geometrical Interpretation, Homogeneous functions, Euler'sTheorem on homogeneous function and corollary, Theorems on total differentials, Equality of $f_{xy}(a, b)$ and $f_{yx}(a, b)$, Equality of f_{xy}andf_{yx}, Taylors theorem for functions of two variables.	Student understands concept of limit, continuity and differentiation of two variable functions. Student can use the results to solve examples.

Course Outcome: Student learned elementary knowledge of differential calculus such as define terms, explain concepts and methods and applies to solve examples.

Program Outcome: Students learned elementary knowledge of Calculus (Differential& Integral). They also learned Differentiation,expansions of functions,mean value theorems,partial differentiation.Student learned interactive computation, Plotting of Graphs using MATLAB Software.

Signature of Teacher :

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc FY Sem-I **Subject: Mathematics Course Code: CCM-1 Section B**
Paper Title: Algebra and Trigonometry **Paper No.: II**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Matrices	Matrix, Different Types of Matrices, Equality of Matrices, Addition (Sum) of Two Matrices, Multiplication ofTwo Matrices, Properties of Matrix Multiplication, Positive Integral Powers of a Matrix, Transpose of a Matrix, Conjugate of a Matrix, Transposed Conjugate of a Matrix, Determinant of a Square Matrix, Minor of an Element, Inverse of a Square Matrix, Singular and Non-singular Matrix, OrthogonalMatrices, The Determinant of an Orthogonal Matrix, Unitary Matrix.	Student can Add, Subtract and Multiply two matrices. Student recognizes the different types of Matrices. Student will be able to find the Inverse of invertible Matrices,Minor of element.
2	Rank of a Matrix	Minor of Order k of a Matrix, Rank of a Matrix, elementary Row and Column Operations, The Inverse of an elementary Operation, Row and ColumnEquivalent, Equivalent Matrices, Working Procedure for Finding Rank Using ElementaryOperations, Row- Echelon Matrix, Row Rank and Column Rank of a Matrix.	Student will be able to determine the row rank,rank of a matrix. Student can transform matrix to Row Echelon form.
3	Linear Equations	Linear Equations, Equivalent Systems, System of Homogeneous Equations. Characteristic Roots and Characteristic Vectors : Definitions, To Find Characteristic Vectors, Cayley-Hamilton Theorem.	Student Solves the System of Linear Equations. Student will be able to find the Characteristic Roots and Characteristic Vectors of a Matrix.
4	Trigonometry	Complex Quantities, DeMoivre's Theorem, Expansions of sines and cosines; Expansions of the sine and cosine of an Angle in Series of Ascending Powers of the Angle, Expansionsof the sines and cosines of Multiple Angles, and of Powers of sines and cosines, Exponential Series for Complex Quantities, Circular Functions for Complex Angles, HyperbolicFunctions, Inverse Circular Functions, Inverse Hyperbolic Functions.	Student can expand sines and cosines of an angle in Series of Ascending Powers of the Angle. Student can find expansions of the sines and cosines of Multiple Angles. Knows about Hyperbolic functions.

Course Outcome: Student got elementary knowledge ofMatrices, Complex Numbers, and Trigonometry such as obtaining inverse, solving simultaneous equations, evaluating expansions of sines and cosine series.

Program Outcome: Students learned elementary knowledge of Calculus (Differential& Integral). They also learned Matrix operations, trigonometry and three dimensional geometry. Student learned interactive computation, Plotting of Graphs using MATLAB Software.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc FY Sem-II **Subject: Mathematics** **Course Code: CCM-2 Section A**
Paper Title: Calculus-II (Integral Calculus) **Paper No.: III**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Integration of Algebraic Rational Functions	Methods of Integration, Partial Fractions, Non-repeated linear factors only in the denominator, Linear or quadratic non-repeated linear factor, Reduction formula, Integration of algebraic rational functions by substitution.	Can understand concept of integration of algebraic rational functions. Student's are able to apply method of integration to find the integral of function.
2	Integration of Irrational Algebraic Functions	Integration of $1/(ax^2+bx+c)^{1/2}$, Integration of $(ax^2 + bx + c)^{1/2}$, Integration of $(px+q) / (ax^2 + bx + c)^{1/2}$, etc. Integration by Rationalisation, Integration of $x^m(a+bx^n)^p$, where m, n and p are not necessarily integers, Reduction formulae	Can understand concept of integration of algebraic irrational functions. Will be able to solve problems using reduction formulae.
3	Integration of Transcendental Functions	Reduction formulae, Integration of $\sin^m x \cos^n x$; Reduction formulae, Definite Integrals, Definition, Properties of definite integral, Definite Integral as the Limit of a Sum.	Student Solve examples of definite integrals using Properties of definite integrals. Student obtains the area and volume of given curves.
4	Beta, Gamma Functions and Multiple Integrals	Gamma Function, A Fundamental Property of Gamma Function, Product of two Integrals, Beta Function, Relation between beta and gamma function, Integrationof $\sin^{2m-1}t \cos^{2m-1}t$, Double integrals, Area bydouble integration, Volume under a surface, Polar coordinates , Evaluation of double integral (statement only), Change from cartesian to Polar Coordinates.	Student understands concept of Gamma and Beta Functions. Student Solves problems on Multiple Integrals.

Course Outcome: Student apply methods to find Integration of Algebraic Rational & Irrational Functions, Transcendental Functions for solving examples. Students also analyze Gamma and Beta Functions, Multiple Integral and Apply integration to find Area and Volume.

Program Outcome: Students learned elementary knowledge of Calculus (Differential& Integral). They also learned Matrix operations, trigonometry and three dimensional geometry. Student learned interactive computation, Plotting of Graphs using MATLAB Software.

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ro-forma for program and course outcomes (2.6.1)

Name of Teacher: K. B. Gacche **Department: Mathematics**
Program: BSc FY Sem-II **Subject: Mathematics Course Code: CCM-2 Section B**
Paper Title: Geometry **Paper No.: IV**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Co-ordinates and Transformation of Co-ordinates	Direction cosines of a line, relation between direction cosines, Projection on a straight line, projection of a segment on another line ,projection of the join of two lines. Angle between two lines. Change of origin, change of the direction of a axes, relation between direction cosines of three mutual Perpendicular lines.	Student understands concepts of Three Dimensional Geometry. Student can find the Direction cosines of any line under the different given conditions .Also find angle between two lines.
2	The Plane	General equation of first degree, Transformation to the normal form, angle between two planes, determination of plane under given conditions, plane through three points, system of planes, two sides of a plane, length of perpendicular from a point to a plane, bisectors of angle between two planes.	Student's are able to find equations of Planes. Student transforms the equation of a plane to the normal form,find the bisectors of angle between two planes.
3	Right line	Representation of line, equation of line through a given point drawn in a given direction,two forms of the equation of line, Transformationfrom the unsymmetrical to the symmetrical form, angle between a line and a plane, coplanar lines, condition for coplanarity of lines, the shortest distance between two lines, length of the perpendicular from a point to a line.	Student finds equations of straight lines. Student transforms equation of line from the unsymmetrical to the symmetrical form, finds shortest distance,length of perpendicular from a point to a line.
4	Sphere, Cones and Cylinders	General equation of a sphere, The sphere through fourgiven points, plane section of a sphere, intersection of two spheres, sphere with agiven diameter, equation of a circle, equation of a tangent plane, planeof contact, angleof intersection of two spheres. Cones, cylinders: Definition, equation of a cone, the right circularcone, definition, the cylinder, equation of a cylinder, the right circular cylinder.	Student can find equations of Spheres, Cones and Cylinders. Student's are able to find the angle of intersection of two spheres.

Course Outcome: Student understands concepts on Three Dimensional Geometry. Student applies methods to solve examples on obtaining equations of plane, right line, cylinder, cone and sphere.
Program Outcome: Students learned elementary knowledge of Calculus (Differential& Integral). They also learned Matrix operations, trigonometry and three dimensional geometry.Student learned interactive computation, Plotting of Graphs using MATLAB Software.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr.K. B. Gacche **Department: Mathematics**
Program: BSc FY Sem- I &II Subject: Mathematics Course Code: CCMP-1
Paper Title: Practical **Paper No.: V**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Introduction to MATLAB	MATLAB Programming language, Built-in Functions, Graphics, computations, External interface and Tool boxes. Basics of MATLAB, MATLAB windows, desktop, command window, workspace, Figure and Editor Windows, Input-output, File types, platform dependence, Printing. Programming in MATLAB: Scripts and14 functions. Script files, function files, Executing of function, writing good functions, sub functions, compiled functions.	Student learns basics of MATLAB language. Student learns various MATLAB commands.
2	Interactive computation :	Matrices and Vectors, input, indexing, matrix manipulation, creating vectors. Matrix and Array operations, Arithmetic operations, Relational operations, logical operations, Elementary math functions, matrix functions, character string. Command-line Functions, Inline functions, Anonymous functions. Built-in functions, finding the determinant of matrix, finding Eigen-values and eigenvectors. Saving and loading Data, Importing data tales, recording a session. Applications: - Linear Algebra. Solving a linear system, Gaussian elimination, Finding Eigen values and eigenvectors, matrix factorization, advanced topics.	Student verifies associativity of matrix addition, left distributive law and right distributive law of matrices. Student finds determinant, Eigen values, Eigen vectors, inverse, powers and characteristics polynomial of a square matrix.
3	Plotting of Graphs	Plotting simple Graphs. Graphics: - Plotting of 2D graphs, Using subplot for multiple graphs, 3DPlots (Drawing of different Geometrical objects), saving and Printing.	Student plots the graph of different functions with the help of MATLAB software. Student draws 3D objects using MATLAB software.

Course Outcome: Student studied MATLAB software and its application to solve problems in matrices and to plot the graphs of different functions.

Program Outcome: Students learned elementary knowledge of Calculus (Differential& Integral). They also learned Matrix operations, trigonometry and three dimensional geometry. Student learned interactive computation, Plotting of Graphs using MATLAB Software.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: K. B. Gacche **Department: Mathematics**
Program: BSc SY Sem-III **Subject: Mathematics Course Code: CCM-3 Section A**
Paper Title: Real Analysis-I **Paper No.: VI**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Sets and functions	Sets and Elements; Operations on sets, Functions, real valued functions, Equivalence, Real numbers, Least upper bounds.	Student understands the basic concepts of sets and their properties. Student can find supremum, infimum and limit points of given sets. Recognizes countable and uncountable sets.
2	Sequences of real numbers	Definition of sequence and subsequence, Limit of a sequence, Convergent sequences, Divergent sequences, Bounded sequences, Monotone sequences, Cauchy sequences.	Student will be able to prove convergence of sequences. Student uses various results to check the behavior of given sequences.
3	Series of real numbers	Convergence and divergence, Series with non-negative terms, Alternative series, Conditional convergence and absolute convergence, Tests for absolute convergence.	Student understands the concept of convergence of infinite series. Student uses comparison tests to check the behavior of given series.

Course Outcome: Student understands conceptof open set, closed set, real sequences, subsequences, convergence of sequences, infinite series, convergence of series, comparison tests for series.

Program Outcome: Student learned elementary knowledge of real sequences, infinite series, various algebraic structures, group theory and ordinary differential equations.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: K. B. Gacche **Department: Mathematics**
Program: BSc SY Sem-III **Subject: Mathematics** **Course Code: CCM-3 Section B**
Paper Title: Group Theory **Paper No.: VII**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Preliminary notions	Mapping, examples of mappings, the integers, group theory, definition of a group, some examples of groups, some preliminary lemmas.	Student understands the concepts on an equivalence relation. Student checks whether the given set, is a group for the given operation or not.
2	Cyclic groups, quotient groups	Subgroups, cyclic groups, cyclic subgroups, A counting principle (Statement only of Lemma 2.5.1, Corollary and Theorem 2.5.1), Normal Subgroups and Quotient groups, Properties and examples.	Student understands the general properties of groups. Able to understand cyclic groups, Student solves problems on groups.
3	Cosets and Cyclic groups	Homomorphism's, Definitions, Examples and Properties, Cauchy's Theorem for Abelian groups, Sylow's, Theorem for Abelian groups (Statement Only), Automorphisms, definitions, Cayley's theorem, permutation groups.	Student understands the concepts of the homomorphism,permutations,automorphisms of groups.

Specify Course Outcome: Student understands concept of group of permutations, cyclic permutations, subgroups, cosets, cyclic groups, normal groups, homomorphism & automorphism. Student uses Lagrange's theorem to solve the problems in number theory.

Specify Program Outcome: Student learned elementary knowledge of real sequences, infinite series, various algebraic structures, group theory and ordinary differential equations.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc SY Sem-III **Subject: Mathematics** **Course Code: CCM-3 Section C**
Paper Title: Ordinary Differential Equations **Paper No.: VIII**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Preliminaries	Polynomials, Determinants, Linear Equations of the First Order Differential Equation, Linear Equation of the First Order, The Equation y¢ + ay= 0, the equation y¢ +ay = b(x), The general linear equations of the first order.	Student understands the basic concepts of a differential equation, order and degree. Student will be able to verify whether the given differential equation is of first order or not.
2	Linear differential equations with constant coefficients	The second order homogeneous equations, IVPs for second order homogeneous equations, Linear dependence and independence, A formula for the Wronskian, The non-homogeneous, The nonhomogeneous equations of order two.	Student understands the concept IVP,LINEAR DEPENDANCE solves the examples Wroskian formula..
3	Linear differential equations with variable coefficients	IVPs for homogeneous equation, Solution of the homogeneous equation, The Wronskain and linear independence.corresponding to a term of the form x^m in the second member.	Student can find integral corresponding to a term of the form e^{ax}, x^m, sin ax in the second member. Student can find the solution of linear equations with variable coefficients.

Course Outcome: Student learns elementary knowledge of ordinary differential equations. Student can solve problems on ordinary differential equations.
Program Outcome: Student learned elementary knowledge of real sequences, infinite series, various algebraic structures, group theory and ordinary differential equations.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: K. B. Gacche **Department: Mathematics**
Program: BSc SY Sem-IV **Subject: Mathematics** **Course Code: CCM-4 Section A**
Paper Title: Real Analysis-II **Paper No.: IX**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Riemann Integral	Definitions and Existence of the integral, Refinement of partitions; Darboux's theorem, Conditions of integrability, Intergrability of the sum and difference of Integrable functions, The integral as a limit of sums (Riemann Sums).Some Integrable Functions	Student understands difference between upper sum & lower sum. Student understands the concept of upper integral & lower integral.
2	Improper Integral-Range of Integration is Finite	Integration and Differentiations, Fundamental Theorem of Calculus, Mean value Theorem. Introduction, Integration of unbounded functions with Finite Limits of Integration, Comparison Test, for Convergence at a of Absolute Convergence	Student understands the concept of Riemann sum and Riemann integral. Student solves problems on Riemann integral Student distinguishes between convergence and absolute convergence of improper integral.
3	Fourier series	Trigonometric Series, Fourier Series , Some Preliminary Theorems, Periodic Function, Some Definitions, Some Theorems The Main Theorem ,Fourier Series of Even and Odd Functions , Half Range Series	Student understands the concept Fourier series.Able to solve the problems based on Fourier series.

Course Outcome: Student understands concept and learns elementary knowledge of Riemann integral and improper integral. Student will be able to test the convergence using comparison and general tests.

Program Outcome: Student understands concept of Riemann integral, improper integral, ring theory and partial differential equations.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr.K. B. Gacche **Department: Mathematics**
Program: BSc SY Sem-IV **Subject: Mathematics** **Course Code: CCM-4 Section B**
Paper Title: Ring Theory **Paper No.: X**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Definition, Examples & Elementary properties of a ring	Ring, Definition and examples of rings, some special classes of Rings, Homomorphisms, Isomorphism	Student checks whether given algebraic structure is a Ring or not. Student learns elementary properties of a ring.
2	Isomorphism of rings, Ideals	Ideals and Quotient Rings, More Ideals and Quotients rings, The field of quotients of an integral domains. Euclidean Rings	Student understands the concept of ideal and principal ideal of a ring. Student checks whether given two rings are isomorphic or not.
3	Polynomial rings, polynomial over an integral domain and Euclidean algorithm	A particular Euclidean Ring, Polynomial Rings, Polynomial over the Rational field, Polynomial Rings over commutative Rings	Student understands the difference between units and associates. Student solves problems on polynomial rings.

Course Outcome: Student understands concept of rings, isomorphism & homomorphism of rings, ideals and principal ideals, polynomial rings and Euclidean rings.

Program Outcome: Student understands concept of Riemann integral, improper integral, ring theory and partial differential equations.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc SY Sem-IV **Subject: Mathematics** **Course Code: CCM-4 Section C**
Paper Title: Partial Differential Equations **Paper No.: XI**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Partial differential equation- basic concepts, Lagrange's linear equations	Partial differential equations, order, method of forming partial differential equations, solution of equations by direct integration, Lagrange's linear equation, working rule, method of multipliers.	Student can classify PDE. Student uses methods to solve problems on PDE. Student finds solution of PDE by direct integration.
2	Charpit's method, Linear homogeneous PDE	Partial differential equations nonlinear in p and q, Charpit's method, linear homogeneous partial differential equations of nth order with constant coefficients, rules for finding the complementary function, rules for finding the particular integral, nonlinear homogeneous, linear equations, Monge's method.	Student solves linear PDE of first and second order. Student uses Charpit's method for solving PDE,finds complementary functions, particular integral.
3	One-dimensional & two-dimensional heat flow, Laplace equations	Introduction, method of separation of variables, equation of vibrating string, solution of wave equation by D' Alembert's method, one dimensional heat flow, two dimensional heat flow, Laplace equation in polar coordinates, transmission line equations.	Student understands concept of non-homogeneous linear equations. Student solves the wave equation by D'Almbert's method. Student applies PDE techniques to predict the behaviour of certain phenomena. Student solves problems using boundary conditions.

Course Outcome: Student understands concept of Partial differential equations. Student learns different methods of finding solutions of PDE and are introduced to real-world problems like wave equation, heat equation, etc.

Program Outcome: Student understands concept of Riemann integral, improper integral, ring theory and partial differential equations.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr.K.B. Gacche **Department: Mathematics**
Program: BSc TY Sem-V **Subject: Mathematics Course Code: MT301**
Paper Title: Metric Spaces **Paper No.: XIII**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Open and Closed sets	Definitions and examples, open and closed sets.	Student understands concepts of open & closed sets. Student can define subspace, closure of a set.
2	Convergence, Completeness, Continuity and Uniform Continuity	Convergence and completeness, Continuity and uniform continuity	Student can verify the convergence of sequences. Student understands concepts of continuity and uniform continuity.
3	Compactness	Compactness, Connectedness.	Student understands concept of compactness. Student can verify compactness of given metric spaces. Student understands concept of connectedness. Student can verify connectedness of given metric spaces.

Course Outcome: Student understands concept of open and closed sets. Student verifies the convergence of sequences, completeness compactness and connectedness of given metric spaces.

Program Outcome: Student understands concept of metric spaces, vector spaces and equilibrium of forces & resultant force of forces.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr.K. B. Gacche **Department: Mathematics**
Program: BSc TY Sem-V **Subject: Mathematics Course Code: MT302**
Paper Title: Linear Algebra **Paper No.: XIV**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Vector spaces	Vector spaces: Elementary basic concepts of vector spaces, Linear independence and bases, Dual spaces.	Student can define vector space, dual space. Student will be able to apply methods to solve examples.
2	Inner product spaces	Inner product spaces, Fields: Extension fields (definitions only)	Student understands concepts of basis, and kernel.inner product space.
3	Linear Transformations.Matrices	Linear transformation: The algebra of linear transformations, Characteristic roots, Matrices. .	Student understands concepts of inverse of a linear transformation. Student recognizes composition of linear maps. Student can associate a matrix with a linear map. Student will be able to find Eigen values and Eigen vectors.

Course Outcome: Students will be able to find dimensions of various vector spaces and by using determinant concept students can solve the linear equations in two, three unknowns.
Program Outcome: Student understands concepts of metric spaces, vector spaces and equilibrium of forces & resultant force of forces.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc TY Sem-V **Subject: Mathematics Course Code: MT303B**
Paper Title: Mechanics-I (Statics) **Paper No.: XV(B)**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Forces Acting on a Particle	Definitions, Law of parallelogram of forces, Determination of magnitude and direction, Resultant of forces, Components and resolved parts,The Algebric Sum of the resolved parts of two forces , To find magnitude and direction, Resultant of parallel forces. .	Student can describe Law of Parallelogram of Forces. Student will be able to define components and resolved parts, finds magnitude and direction of the resultant of forces.
2	Equilibrium of Forces Acting on a Particle	Triangle Law of forces, Converse of triangle law of forces, Polygon of forces Lami's Theorem, Conditions of equilibrium of forces acting on a particle..	Student understands concept of resultant of Parallel Forces. Student will be able to explain Triangle law of Forces.
3	Forces Acting on a Rigid Body	Introduction, Moment of force, The sum of vector moment of a system of forces, The Sum of the vector moments of two like parallel forces acting on a rigid body, Couples, Two couples acting in one plane upon a rigid body, Equivalent couples, The vector of the resultant couple of two couples, A System of forces acting upon a rigid body, Conditions of equilibrium of forces acting on a rigid body and Cartesian form, Conditions of equilibrium of coplanar forces acting on a rigid body.	Student understands concept of equilibrium of Forces. Student evaluates examples on Vector Moment of the Resultant Couple of two Couples acting upon a Rigid Body. Student understands concept of equivalent couples, vector moment. Student will be able to state Conditions of Equilibrium of Forces

Course Outcome: Students learns basic, primary knowledge of motion, force and their relations. Studentunderstands the force systems, the concept of motion of particles and rigid bodies.

Program Outcome: Student understands concepts of metric spaces, vector spaces andequilibrium of forces & resultant force of forces.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc TY Sem-VI **Subject: Mathematics Course Code: 304**
Paper Title: Numerical Analysis **Paper No.: XVI**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Differences, Operators, Interpolation with equal intervals	Introduction, Differences, Theorem, Factorial notation, The operator E, Properties of E and , Δ , the operators D and∇, Interpolation, Extrapolation, Interpolation with equal intervals, Newton- Gregory formula for forward and backward interpolation, Equidistant terms with one or more missing terms. Interpolation for unequal intervals of the arguments, Divided differences with unequal intervals, Divided differences, When two or more arguments are same, Properties of divided differences (Theorems 1, 2 only)	Student understands concept of various operators, Learns forward and backward formulae and sove examples based on it.
2	Unequal intervals,Central Differences	Properties of divided differences(Theorems 3, 4 only), Newton's, Formula for unequal intervals, Lagrange's, Formula for unequal intervals, Central differences (, , , δ σ μ ∇), Interpolation formulae: Gauss, Bessel and Stirling's..	Student s are able to recognize formulae for unequal intervals and for central differences and can solve examples based on it.
3	Numerical differentiation and quadrature	Numerical differentiation, Introduction, Approximate Expressions for the derivative of a function, Unsymmetrical expressions for third order derivative, Numerical quadrature, Introduction, General quadrature formula, Trapezoidal, Simpson's one-third and three-eight rules. Weddle's rule. Numerical solution of O.D.E., Introduction, equation of first order, Euler"s method, Euler"s modified method, Picard's method, Talyor series method.	Student can find the derivatives and integration using the learnsd formulae.

Course Outcome: Student can find the missing terms in the given data using numerical techniques. Student can apply numerical derivation and numerical integration methods for solving problems. Student can find the solutions of ordinary differential equations.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc TY Sem-VI **Subject: Mathematics** **Course Code: MT305**
Paper Title: Integral Transforms **Paper No.: XVII**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Laplace Transformations	Introduction , Laplace Transform, Important Formulae, Properties of Laplace Transforms, Laplace Transforms of the derivative of (t) f , Laplace Transforms of derivative of order n , Laplace Transform of integral of (t) f , Laplace Transform of (t) t f • (Multiplication by t), Laplace Transform of 1 (t)f t · (Division by t), Unit Step Function. Second Shifting Theorem, Impulse Function, Periodic Functions, Convolution Theorem, Evaluation of integrals, Formulae of Laplace transform, Properties of Laplace Transform.	Student understands Laplace foroulae,laplace transformations ,using laplace properties solve examples.
2	Inverse Laplace Transforms	Inverse Laplace Transforms, Important formulae ,Multiplication by s, Division by s , First Shifting property, Second Shifting property, Inverse Laplace transform of derivatives, Inverse Laplace Transform of Integrals, Partial fractions Method , Inverse Laplace transform by Convolution, Solution of Differential Equation by Laplace transforms , Solution of Simultaneous Differential Equations by Laplace transforms.	Student understands concept of inverse Laplace transform. Student can solve examples on inverse Laplace transforms.
3	Fourier Transforms	Introduction, Integral Transforms, Fourier Integral Theorem, Fourier sine and Cosine Integrals, Fourier Complex Integral, Fourier transforms, Fourier sine and cosine transforms, Properties of Fourier Transforms. .	Student studies properties of Fourier Transforms. Student uses Fourier Integral theorem for solving problems.

Course Outcome: Student understands the concept of Integral Transforms. Student can identify integral transforms by their integration limits and kernels. Student can apply the integral transforms for evaluating integrals.
Program Outcome: Student understands some fundamental ideas of complex analysis, integral transforms, Laplace transforms. Student also gets an elementary knowledge about Topology.

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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. K. B. Gacche **Department: Mathematics**
Program: BSc TY Sem-VI **Subject: Mathematics** **Course Code: MT306 B**
Paper Title: Mechanics-II (Dynamics) **Paper No.: XVIII(B)**

Unit No.	Unit Name	Topics	Unit-wise Outcome
1	Kinematics and Dynamics of a particle in two dimensions	Introduction, Definitions, Expressions for velocity and acceleration, Components of velocity and acceleration, Tangent and unit vector, Rate of change of a unit vector moving in a plane, Curvature and principal normal, Tangential and normal components of velocity and acceleration, Angular speed and angular velocity, Angular acceleration, The radial and transverses directions, Find the radial and transverse components of velocity and accelerations.	Student will be able to define velocity and acceleration,components of velocity and acceleration,differentiate between normal,tangential and normal components of velocity and acceleration,angular , solves examples depending on it.
2	Kinematics of a particle	Introduction, Newton's law of motion, Matter, Linear momentum, Impulsive force and its impulse, Unit of impulse, Conservation of linear momentum, Impact of two bodies, Work, Work done by a force, Unit of work, Power, Energy, Kinetic energy, Potential Energy Kinetic energy of particle of mass m moving with velocity, Definition of scalar and vector point function, Scalar and vector field, Field of force, Conservative field of force , Potential function	Student understands concepts of Newton's laws of motion and its importance in physical sciences, analyze the impulsive force and its impulsive.
3	Motion of a projectile and motion in resisting medium	Rectilinear motion, Motion under gravity, Projectile, Range on inclined plane projectile to pass through a given point (h, k), The relation $t_1t_2= 2R/g$	Student understands to find the motion of projectile and derivation of its trajectory,path of a projectile.

Course Outcome: Student can understand Newtons laws of motion ,understands the expressions of velocity and acceleration, motion in resisting medium.
Specify Program Outcome: Student understands some fundamental ideas of complex analysis, integral transforms, Laplace transforms. Student also gets an elementary knowledge about projections of a particle.

Signature of Teacher :