K.T.S.P.Mandal's

Hutatma Rajguru Mahavidyalaya, Rajgurunagar

Department Of Mathematics

Teaching Plan Report

Academic Year-2021-22

Sem-I

Sr. No.	Class	Subject	Name of Teacher
1	F.Y.B.Sc.	Algebra	Prof. Gargote A.M.
		Calculus-I	Prof. Gargote A.M.
2	S.Y.B.Sc.	Calculus of Several Variable	Prof. Wayal R.M.
		Numerical Analysis & its application	Prof. Udhane R.B.
3	T.Y.B.Sc.	Metric Spaces	Prof. Wayal R.M
		Real Analysis-I	Prof. Rakshe A.R.
		Group Theory	Prof. Karle S.N.
		Ordinary Diff. Equation	Prof. Wayal R.M.
		Operation Research	Prof. Rakshe A.R.
		Laplace Transform & Fourier series	Prof. Gargote A.M.
4	F.Y.B.Cs.	Discrete Mathematics	Prof. Rakshe A.R.
		Matrix Algebra	Prof. Karle S.N..
5	S.Y.B.Cs.	Group and coding theory	Prof. Karle S.N..
		Numerical Techniques	Prof. Udhane R.B.
6	F.Y.B.Com	Business Mathematics & Statistics	Prof. Udhane R.B.

Class: S.Y.B.Sc **Division :A**

Paper : Calculus of Several Variables **No. of Lectures:36**

Month	Topic	Subtopic
Oct 2021	**Limits and Continuity**	Limit by using substitution, different paths and polar co-ordinates
Nov 2021	**Limits and Continuity**	Functions of Several Variables, Functions of two variables, Domain and Range, Graphs, Level Curves, Functions of Three or More Variables

Dec 2021	**Partial Derivatives and Differentiability**	Definition and examples of Higher Derivatives, Clairaut's Theorem (Statement Only), Partial Differential Equations, Wave equation. Differentiable function, Differentials. Chain Rule, Homogeneous Functions, Euler's theorem
Jan 2022	**Extreme Values. Multiple Integral**	Extreme values of functions of two variables. Necessary conditions for extreme values. Second Derivative Test. Lagrange Multipliers. Iterated Integrals, Fubini's Theorem. Double integral over general regions, Change of order of integration for two variables.
Feb 2022	**Multiple Integral**	Double integral in Polar coordinates. Triple integrals, Evaluation of triple integrals. Triple integrals in spherical coordinates. Jacobians, Change of variables in multiple integrals

Class: T.Y.B.Sc **Division :A**

Paper : Metric Spaces **No. of Lectures:36**

Month	Topic	Subtopic
Oct 2021	**Basic Notions**	Definition and examples. Open Balls.
Nov 2021	**Basic Notions, Convergence**	Open Sets, Convergent Sequences
Dec 2021	**Convergence Continuity**	Limit and Cluster points, Cauchy Sequences and Completeness, Bounded Sets, Dense Sets Boundary of a set. Continuous Functions. Equivalent Definitions of Continuity, Topological Property. Uniform Continuity. Limit of a Function
Jan 2022	**Compactness and Connectedness**	Open and closed maps. Compact Spaces and their Properties
Feb 2022	**Compactness and Connectedness**	Connected Spaces

Class: T.Y.B.Sc. **Division: A**

Paper: Ordinary Differential Equation **No. of Lectures:36**

Month	Topic	Subtopic
Oct 2021	**Linear Differential Equations with constant coefficients**	Constant coefficient homogeneous equations Characteristic equations, distinct real roots, repeated roots
Nov 2021	**Linear Differential Equations with constant**	Complex roots. Particular solution, Initial value problem,The operator $\frac{1}{f(D)}$ and its evaluation for the functions $x^m, e^{ax}, e^{ax}V$.

	coefficients	
Dec 2021	**Linear Differential Equations with constant coefficients, Non - Homogeneous Linear Equations**	xV and the operator $\frac{1}{D^2+a^2}$acting on sin ax and cos ax, Principle of superposition, Method of undetermined coefficients 2.3 Method of reduction of order 2.4 Method of variation of parameters.
Jan 2022	**Series Solutions of Linear Second Order Equations**	Review the properties of power series, Series solution near an ordinary point, Regular singular points, Euler equations, Introduction to system of differential equations
Feb 2022	**System of Equations**	Linear systems: basic theory of homogeneous linear systems, constant coefficient Homogeneous systems.

Class: T.Y.B.Sc. **Division: A**

Paper: LaTeX **No. of Lectures:36**

Month	**Topic**	**Subtopic**
Dec 2021	**Introduction to LaTeX, Formatting Words, Lines, and Paragraphs**	Definition and application of LaTeX, Preparation and Compilation of LaTeX input file LaTeX Syntax, Keyboard Characters in LaTeX Unit. Text and Math Mode Fonts. Emphasized and Colored Fonts, Sectional Units, Labeling and Referring Numbered Items, Texts Alignment and Quoted text, New Lines and Paragraphs, Creating and Filling Blank Space Producing Dashes Within Texts Unit
Jan 2021	**Listing and Tabbing Texts**	Listing Texts, Tabbing Texts Through the tabbing Environment
Dec 2021	**Table Preparation**	Table Through the tabular Environment, Table Through the tabularx Environment, Vertical Positioning of Tables, Sideways (Rotated) Texts in Tables, Adjusting Column Width in Tables, Additional Provisions for Customizing Columns of Tables, Merging Rows and Columns of Tables.

Class - F.Y.B.Cs(Comp. Sci) **Subject:- Discrete Mathematics**

Name:-Prof. Rakshe A.R. **No. of lectures per week - 3**

Month	**Topic**
	Propositional Logic, Predicates and Quantifiers Rules of Inference,

October 2021	Poset, Hasse diagram. Lattices, Complemented lattice , Bounded lattice and Distributive lattice . Boolean Functions Boolean Function of degree n,
November 2021	Boolean identities, Definition of Boolean A lgebra .Representation of Minterm, Maxterm Disjunctive normal form, Conjunctive normal Form. Counting Principles Cardinality of a finite set. .
December 2021	The Product Rule, The Sum Rule, The Inclusion-Exclusion Principle. The Pigeonhole Principle: Statement, The Generalized Pigeonhole Principle, Its applications.
January 2022	Permutation and Combination with Repetitions, Permutations with Indistinguishable Objects, Distributing objects into box.
February 2022	Recurrence Relations : Introduction, Formation. Linear Recurrence Relations with constant coefficients. Homogeneous Solutions. Particular Solutions. Total Solutions

Class - T.Y.B.Sc **Subject:- Operation Research**
Name:-Prof. Rakshe A.R. **No. of lectures per week - 36**

Month	Topic
October 2021	Two variable LP Model, Graphical LP solution, Selected LP Applications, Graphical Sensitivity analysis. LP Model in equation form,
November 2021	Transition from graphical to algebraic solutions, the simplex method, Artificial starting solutions.
December 2021	Unbounded Solution , No Solution, Alternate Solution .
January 2022	Definition of the dual problem, How to find primal solution LPP.
February 2022	Primal dual relationship , Definition of the Transportation model . The Transportation algorithm , The Hungarian method , Simplex explanation of the Hungarian method.

Class - T.Y.B.Sc **Subject:- Real Analysis - I**
Name:-Prof. Rakshe A.R. **Total No. of lectures per week - 03**
No. of Students : 08

Month	Topic
October 2021	Operations on sets, Functions, Real-valued functions, Equivalence countability, Real numbers, Cantor set, Least upper bounds
November 2021	Definition of sequence and subsequence, Limit of a sequence, Convergent sequences, Monotone sequences, Divergent sequences, Limit superior

December 2021	Limit inferior, Cauchy sequences ,Convergent and divergent series, series with non-negative terms, alternating series, Conditional and Absolute convergence, Rearrangement of series
January 2022	Tests of absolute convergence, ratio test, comparision test , cauchy condesation test
February 2022	series whose terms form a non-increasing sequence, The class $l2$

Class - F.Y.B.Sc **Subject:- Algebra**

Name:-Prof. Gargote A.M. **No. of lectures - 36**

Month	Topic
October (2021)	Definition of sets,types of sets,def of Relation, Equivalence relation & examples Equivalence classes and partitions of a set ,Def of function & its example, Basic terminology, Types of Function ,Inverse of function, Composition of function
November (2021)	Mathematical induction,well ordering principle ,the Division Algorithm,The greatest common Divisor,Euclid's lemma,the Least common multiple,the Euclidean Algorithm
December (2021)	The Fundamental theorem of Arithmatic, Def of prime numbers,theorems and examples,Euclid's lemma, The theory of Congruences, Basic proprties of Congruences,theorems and examples,Fermat's theorem and examples.
January (2022)	Introduction of Complex number,sum & products of complex no.s,Basic algebraic properties of complex no.s,Moduli, Complex conjugates, Exponential form, Products & Quotients.
February (2022)	De-Moivres thm,Roots of complex no.s, The nth roots of unity, Regions in complex plane.

Class - F.Y.B.Sc **Subject:- Calculus I**

Name:-Prof. Gargote A.M. **No. of lectures - 36**

Month	Topic
October (2021)	Algebraic properties of R, Order properties of R, Well-Ordering Property of N, Arithmetic mean-Geometric mean inequality, Bernoulli's inequality, Absolute value function and its properties, triangle inequality and its consequences.
November (2021)	Definitions of Upper bound, Lower bound, supremum, infimum of subsets of R, completeness property of R, Archimedean property and its consequences, The density theorem**,** sequences of real numbers
December (2021)	Definition of limit of sequence and uniqueness of limit, bounded sequence, Monotone sequences, Monotone convergence theorem, Definition of subsequence, Divergence criteria, Monotone Subsequence theorem, Bolzano -Wierstrass theorem, The Completeness Property of R.
January (2022)	Functions, domain and range, graphs of functions, Piecewise defined functions, increasing and decreasing functions, symmetry, common

	functions, limit of a function, divergence criteria, Squeeze theorem, one-sided limits, infinite limits, Definition of continuous function at a point , sequential criterion for continuity, Divergence criterion, combination of continuous functions.
February (2022)	Properties of continuous functions on an interval, Boundedness theorem, The minimum -maximum theorem, Location of root theorem, Bolzano's intermediate value theorem. Continuous function maps closed bounded interval to closed bounded interval.

Class:- T.Y.B.Sc **Subject:- Laplace Transforms and Fourier series**

Name:-Prof. Gargote A.M. **No. of lectures per week - 03**

Month	Topic
October (2021)	Definition, Laplace Transform of some elementary functions. Some important properties of Laplace Transform.
November (2021)	Laplace Transform of derivatives, Laplace Transform of Integrals., Methods of finding Laplace Transform, Evaluation of Integrals.
December (2021)	The Gamma function, Unit step function and Dirac delta function. Definition, Some inverse Laplace Transform. Some important properties of Inverse Laplace Transform, Inverse Laplace Transform of derivative.
January (2022)	Inverse Laplace Transform of integrals. Convolution Theorem, Evaluation of Integrals. Solution of Ordinary Differential Equations with constant coefficients.
February (2022)	Definition and examples of Fourier Series.

Class - S.Y.B.Sc. **Subject:- Numerical Analysis &It's Application**

Name:- Prof. Udhane R.B. **No. of lectures - 36**

Month	Topics
November(2021)	Introduction, Error and their computation, Bisection method - without derivation and convergence, The method of false position, Newton - Raphson Method - without derivation &convergence.
December(2021)	Introduction, Finite difference operators and their relation, Difference Operators - Forward , Backward , Shift (E), Relations between them. Forward & Backward Difference tables. Factorial notation Newton's Forward Difference & Backward Difference

January(2022)	interpolation Formula, Lagrange's formula for interpolation with unequally space points, Numerical Differentiation. Numerical Integration - A General Quadrature formula, The Trapezoidal rule,Simpson's 1/3rd rule, Simpson's 3/8th rule.
February(2022)	Introduction. Taylor's series method, Picard's Method successive ,pproximations. Euler's & Modified Euler's Methods. Runge Kutta Method

Class - F.Y.B.Com **Subject:- Business Mathematics & Statistics**
Name:- Prof. Udhane R.B. **No. of lectures - 48**

Month	Topics
November(2021)	Concept of Present value and future value, simple interest ,compound interest, nominal and effective rate of interest, example and problem, Ordinary Annuity, Sinking Fund, Annuity due, present value and future value, equated monthly installment by interest of reducing balance and flat interest method, examples and problem
December(2021)	Concept of share, face value, market value, dividend, brokerage, equity shares, preferential shares, examples and problem. Concept of mutual funds, problems on calculation of net income ,Change in net asset value.
January(2022)	Definition of Statistics, Scope of statistics in economics , Management Science and Industry. Concept population and sample, method of data collection: Census and sampling with illustration . method of random sampling -(SRSWR, SRSWOR, Stratified, Systematic)
February(2022)	Frequency distribution : Row data, attributes and variables, classification of data, frequency distribution, cumulative frequency distribution, Histogram and ogive curves. Requisites of ideal

Class - S.Y.B.Sc(Comp.Sci) **Subject:- Numerical Techniques**
Name:- Prof. Udhane R.B. **No. of lectures - 36**

Month	Topics
November(2021)	Introduction, Error and their computation, Bisection method - without derivation and convergence, The method of false position, Newton - Raphson Method - without derivation &convergence.
December(2021)	Introduction, Finite difference operators and their relation, Difference Operators - Forward , Backward , Shift (E), Relations between them. Forward & Backward Difference tables. Factorial notation Newton's Forward Difference & Backward Difference.

January(2022)	interpolation Formula , Lagrange's formula for interpolation with unequally, Divided Difference, Newton's Divided Difference formula. Introduction. Numerical Differentiation. Numerical Integration - A General Quadrature formula, The Trapezoidal rule,Simpson's 1/3rd rule, Simpson's 3/8th rule.
February(2022)	Euler's & Modified Euler's Methods. Runge Kutta Method (First, Second,third and fourth order).

Class:-T.Y.B.Sc. **Sub-Group theory and problem course**
Name:-Prof. Karle S.N **No. of lectures -36**

Month	Topic
Oct 2021	Binary Operations, Isomorphic Binary Structures, .Groups.
Nov 2021	Exapmles of groups, Subgroups, .Cyclic Groups.
Dec 2021	Cosets, .Groups of Permutations, .Orbits, Cycles, Alternating Groups, Cosets the Theorem of Lagrange
Jan 2022	Direct Products, Homomorphism, Factor Groups, Factor Group, Computations.
Feb 2022	Simple Groups

Class:-T.Y.B.Sc. **Sub-Programming in Python–I**
Name:-Prof. Karle S.N. **No. of lectures - 36**

Month	Topic
Dec 2021	Installation of Python, Values and types: int, float and str, The Print Function: Print basics, Variables: assignment statements, printing variable values, types of variables. Mathematical Operators, operands and precedence:+, -, /, *, **, % PEMDAS (Rules of precedence), String operations: + : Concatenation, * : Repetition, Boolean operator: Comparison operators: ==, !=, >, =, <=, Logical operators: and, or, not, Mathematical functions from math, cmath modules, random module,Keyboard input: input() statement, Calculus: Differentiation, Integration, Limit andSeries, Strings: Length (Len function), String traversal: Using while statement, Using for statement, String slice, Comparison operators (>, <, ==),Lists: List operations, Use of range function, Accessing list elements, List membership and for loop, List operations, Updating list: addition, removal or updating of elements of a list, Tuples: Defining a tuple, Index operator, Slice operator, Tuple assignment, Tuple as a return value

Jan 2022	Conditional and alternative statements, Chained and Nested Conditionals: if, if-else, if-elif-else, nested if, nested if-else,Looping statements such as while, for etc, Tables using while, Functions: Calling functions: type, id, Type conversion: int, float, str, Composition of functions, Returning values from functions, User defined functions, Parameters and argument, Matrix construct, eye(n), zeros(n,m) matrices, Addition, Subtraction, Multiplication of matrices, powers and invers of a matrix.Accessing Rows and Columns, Deleting and Inserting Rows and Columns, Determinant, reduced row echelon form, nullspace, columnspace, Rank, Solving systems of linear equations (Gauss Elimination Method, Gauss Jordan Method,LU- decomposition Method) Eigenvalues, Eigenvectors, and Diagonalization .
Feb 2022	Roots of Equations, Newton-Raphson Method, False Position (RegulaFalsi) Mehtod Numerical Integration: Trapezoidal Rule, Simpson's 1/3rd Rule, Simpson's 3/8th Rule Installation of numpy, matplotlib packages, Graphs plotting of functions Different formats of graphs, PyDotPlus (Scalable Vector Graphics), PyGraphviz. Markers and line styles, Control colors ,Specifying styles in multiline plots, Control linestyles, Control marker styles. Navigation Toolbar with polar plots, Control radial and angular grids. Three-dimensional Points and Lines, Three-dimensional Contour Plots, Wireframes and Surface Plots.

Class:-S.Y.B.Sc.(Computer Science) **Subject - Groups and coding theory**

Name:-Prof. Karle S.N. **No. of lectures - 36**

Month	Topic
Oct 2021	Division Algorithm (without Proof), G.C.D. using division algorithm and expressing it as linear combination , Euclid's lemma, Equivalence relation (revision), Congruence relation on set of integers, Equivalence class partition
Nov 2021	Binary Operation , Group: Definition and Examples, Elementary Properties of Groups
Dec 2021	Order of a group, order of an element , Examples (Zn, +) and (U(n), *) , Subgroup definition, Finite subgroup test, subgroups of Zn , Generator, cyclic group, finding generators of Zn(Corollary 3,4), Permutation group, definition, composition of two permutations, representation as product of disjoint cycles, inverse and order of a permutation, even/ odd permutation Cosets: Definition, Examples and Properties, Lagrange Theorem(without
Jan 2022	Coding of Binary Information and Error detection , Decoding and Error Correction , Public Key Cryptography I
Feb 2022	Public Key Cryptography II

Class:-F.Y.B.Sc.(Computer Science) **Subject -Matrix Algebra**

Name:-Prof. Karle S.N. **No. of lectures -36**

Month	Topic
Oct 2021	Introduction, Matrix Operations
Nov 2021	The Inverse of a Matrix, Characterization of invertible matrices System of Linear equations , Row reduction and echelon forms ,Vector equations
Dec 2021	The matrix equation Ax=b ,Solution sets of linear systems, Partitioned Matrices, Matrix factorization [Lu decomposition] , .Linear Independence , Introduction to linear transformation
Jan 2022	The matrix of linear transformation, Subspaces of Rn, Dimension and Ranks, Introduction to determinants
Feb 2022	Properties of determinants

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