

K.T.S.P.Mandal's
HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR
DEPARTMENT OF MATHEMATICS
SYLLABUS COMPLETION REPORT
ACADEMIC YEAR-2022-23

Sem-II

Sr. No.	Class	Subject	Name of Teacher
1	F.Y.B.Sc.	Analytical Geometry	Prof. Wayal R.M.
		Calculus-II	Prof. Rakshe A.R.
2	S.Y.B.Sc.	Linear Algebra	Prof. Wayal R.M.
		Vector Calculus	Prof. Wayal R.M.
3	F.Y.B.Cs.	Graph Theory	Prof. Rakshe A.R.
		Linear Algebra	Prof. Bhambure P.D.
4	S.Y.B.Cs.	Computational Geometry	Prof. Arude J.B.
		Operation Research	Prof. Rakshe A.R.
5	F.Y.B.Com	Business Mathematics & Statistics - II	Prof. Bhambure P.D.
6	F.Y.B.B.A.(C.A.)	Business Mathematics	Prof. Arude J.B.

Class - F.Y.B.Sc.

Subject:- Analytical Geometry

Name:-Prof. Wayal R. M.

No. of lectures per week - 03

Month	Topic
March	Change of axes Translation and Rotation. Conic Section: general equation of second degree in two variables. Centre of conic ,nature of conic.
April	Reduction of conic to standard form. Direction cosines and direction ratios, equation of plane , normal form ,transform to the normal form , plane passing through three non-linear points ,intercept form ,angle between two planes , Distance of a point from plane ,distance between parallel planes, system of planes, two sides of planes ,bisector of planes, Equation of a line in symmetric
May	Unsymmetrical forms, line passing through two points, angle between a line and a plane, perpendicular distance of a point from a plane, condition for two lines to be coplanar. Equation of a sphere in different forms, plane section of a sphere Equation of a circle, sphere through a given circle ,intersection of sphere and a line , equation of tangent plane to sphere

Class: S.Y.B.Sc

Subject: Linear Algebra

Name: Prof. Wayal R.M.

No. of lectures per week-03

Month	Topic
March	Row echelon form and reduced row echelon form of a matrix, consistency of homogeneous and non-homogeneous system of linear equations using rank, condition for consistency, Gauss elimination and Gauss-Jordan method, Vector spaces, subspaces.

April	Linear dependence and independence, Dimension of a vector space, row, column and null space of a matrix.
May	Rank and nullity. Definition and example of a linear transformation, kernel and range of L. T., rank-nullity theorem, matrices and linear transformation, linear isomorphism.

Class: S.Y.B.Sc

Subject: Vector Calculus

Name: Prof. Wayal R.M.

No. of lectures per week-03

MONTH	TOPIC
March	Curves in Space, Limits and Continuity, Derivatives and Motion, Differentiation, Rules for Vector Function, Vector Functions of Constant Length. Integrals of Vector Functions. Arc Length along a Space Curve, Speed on a Smooth Curve, Unit Tangent Vector. Curvature of a Plane Curve, Circle of Curvature for Plane Curves, Curvature and Normal Vectors for a Space Curve., Line Integral of Scalar Functions, Additivity, Line integral in the Plane.
April	Vector Fields, Gradient Fields, Line Integral of Vector Fields. Work done by a Force over a Curve in Space, Flow Integrals and Circulation for Velocity Fields, Flow across the Simple Closed Plane Curve. Path Independence, Conservative and Potential Functions. Divergence, Two forms for Green's Theorem, Green's Theorem in the Plane.
May	Parameterizations of Surfaces. Implicit surfaces, Surface integrals, Orientation of Surfaces. Surface Integrals of Vector Fields. The Curl Vector Field, Stokes' Theorem, Conservative Fields and Stokes' Theorem.

Class - F.Y.B.Sc.

Subject: Calculus -II

Name:-Prof. Rakshe A.R.

No. of lectures per week - 03

Month	Topic
March	The Derivatives, Definition of the derivative of a function at a point, every differentiable function is continuous, Rules of differentiation, Caratheodary's theorem(without proof), The chain rule, Derivative of inverse function (without proof , only examples). The Mean Value Theorems, Interior extremum theorem, Mean Value theorems and their Consequences, Intervals of increasing and decreasing of a function,first derivative test for extrema.
April	Derivative of inverse function (without proof , only examples). The Mean Value Theorems, Interior extremum theorem, Mean Value theorems and their Consequences, Intervals of increasing and decreasing of a function,first derivative test for extrema.L'Hospital Rule, Indeterminate forms, L'Hospital Rules(without proof),Taylor's theorem and Maclaurin'stheorem with Lagrange's form of remainder(Without proof), The nth derivative and Leibnitz theorem for successive differentiation Separable equations, Existence and Uniqueness of solutions of nonlinear equations
May	The nth derivative and Leibnitz theorem for successive differentiation Separable equations, Existence and Uniqueness of solutions of nonlinear equations Linear first order equations. Transformation of nonlinear equations to separable equations. Exact differential equations, Integrating factors.

Class - F.Y.B.Cs.

Subject:- Graph Theory

Name:-Prof. Rakshe A.R .

No. of lectures per week-03

Month	Topics
March	Definition, Elementary terminologies and results, Graphs as Models. Special types of graphs. Isomorphism Adjacency and Incidence Matrix of a Graph Subgraphs, induced subgraphs, Vertex deletion, Edge deletion. Complement of a graph and self-complementary graphs. Union, Intersection and Product of graphs. Fusion of vertices.
April	Connected Graphs Walk, Trail, Path, Cycle : Definitions and elementary properties. Connected Graphs : definition and properties. Distance between two vertices, eccentricity, center, radius and diameter of a graph. Isthmus, Cutvertex : Definition and properties. Cutset, edge-connectivity, vertex connectivity. Weighted Graph and Dijkstra's Algorithm Eulerian and Hamiltonian Graphs 05 Lectures Seven Bridge Problem, Eulerian Graph : Definition and Examples, Necessary and Sufficient condition. Fleury's Algorithm.
May	Hamiltonian Graphs : Definition and Examples, Necessary Condition. Introduction of Chinese Postman Problem and Travelling Salesman Problem. Definition, Properties of trees. Center of a tree. Binary Tree : Definition and properties. Tree Traversal : Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal, Prefix Notation. Spanning Tree : Definition, Properties, Shortest Spanning Tree, Kruskal's Algorithm. Definition, Examples Elementary Terminologies and properties. Special Types of Digraphs. Connectedness of digraphs. Network and Flows : definition and examples.

Class - S.Y.B.Cs.

Subject:- Operational Research

Name:-Prof. Rakshe A.R .

No. of lectures per week-03

Month	Topic
March	Graphical method_Two-Variable LP Model , Graphical LP Solution, Linear Programming Applications
April	LP Model in Equation Form , Transition from Graphical to Algebraic Solution ,The Simplex Method , Artificial Starting Solution , Special Cases in Simplex Method
May	Dual problem , Definition of the dual problem , Primal dual relationships ,Examples, Transportation problem ,Definition of the Transportation problem
June	The Transportation Algorithm ,The Assignment Model Optimal solution of two person zero sum games , Solution of mixed strategy games

Class - F.Y.B.Cs.

Subject:- Linear Algebra

Name:-Prof. Bhambure P. D.

No. of lectures per week - 03

Month	Topic
March	Vector Spaces: Vector spaces & subspaces, Null spaces column spaces & linear transformations, Linearly independent sets: Bases, Co-ordinate systems, The dimension of a vector space, Rank
April	Eigen Values: Eigen values & Eigen vectors, The characteristic equation, Diagonalization, eigen vectors & linear transformations Orthogonality & Symmetric matrices: Inner Product, length & orthogonality, Orthogonal sets

May	Orthogonal Projections diagonalization of Symmetric Matrices, Quadratic forms
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Class - F.Y.B.Com.

Subject:- Business Mathematics and Statistics-II

Name:-Prof. Bhambure P. D.

No. of lectures per week:-04

Month	Topics
March	Definition of a Matrix, Types of Matrices, Algebra of Matrices, Determinants, Adjoint of a Matrix, Inverse of a Matrix via Adjoint Matrix, Homogeneous System of Linear equations, Condition for Consistency of homogeneous system, Solution of Non-homogeneous System of Linear equations, Applications in Business and Economics, Examples and Problems.
April	Concept of index number, price index number, price relatives. Problems in construction of index number. Construction of price index number: Weighted index Number, Laspeyre's, Paasche's and Fisher's method. Cost of living / Consumer price index number: Definition, problems in construction of index number. Methods of construction: Family budget and aggregate expenditure. Inflation, Uses of index numbers, commonly used index numbers. Examples and problems.
May	Definition and terms in a LPP, formulation of LPP, Solution by Graphical method, Examples and Problems, Concept and types of correlation, Scatter diagram, Interpretation with respect to magnitude and direction of relationship. Karl Pearson's coefficient of correlation for ungrouped data. Spearman's rank correlation coefficient. Concept of regression, Lines of regression for ungrouped data, predictions using lines of regression. Regression coefficients and their properties. Examples and problems.

P. D. Bhambure
Prof. P. D. Bhambure

Class - S.Y.B.Cs

Subject:- Computational Geometry

Name:-Prof. Arude J. B.

No. of lectures per week: 03

Month	Topics
March	Two dimensional transformations ,Introduction , Representation of points, transformation of a unit square, Solid body transformations, Transformation and homogeneous coordinates. Translation , Rotation about an arbitrary point, Reflection through an arbitrary line , Projection – a geometric interpretation of homogeneous coordinates, Overall Scaling , Point at infinity
April	Three dimensional transformations , Introduction, Three dimensional – Scaling, shearing, rotation, reflection, translation. Multiple transformations , Rotation about – an axis parallel to coordinate axes, an arbitrary axis in space. Reflection through – coordinate planes, planes parallel to coordinate planes, arbitrary planes , Affine and perspective transformations, Orthographic projections , Axonometric projections.
May	Oblique projections , Single point perspective transformations Vanishing points , Plane Curves , Introduction. Curve representation ,Non – parametric curves , Parametric curves. Parametric representation of an ellipse and generation of ellipse.

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Prof. Arude J.B.

Class - F.Y.B.B.A.

Subject:- Business Mathematics

Name:-Prof. Arude J. B.

No. of lectures per week - 04

Month	Topic
March	Multivariable data, Definition of a Matrix, Types of Matrices, Algebra of Matrices, Determinants, Ad joint of a Matrix, Inverse of a Matrix via ad joint Matrix, Homogeneous System of Linear equations, Condition for Uniqueness for the homogeneous system, Solution of Non homogeneous System of Linear equations Condition for existence and uniqueness of solution, Solution using inverse of the coefficient matrix .
April	Ratio- Definition, Continued Ratio, Inverse Ratio, Proportion, Continued Proportion, Direct, Proportion , Inverse Proportion, Variation, Inverse Variation, Joint .Variation, Percentage- Meaning and Computations of Percentages , Simple Interest, Compound interest (reducing balance & Flat Interest rate of interest), Equated Monthly Installments(EMI), Problems
May	Terms and Formulae, Trade discount, Cash discount, Problems involving cost price, Selling Price, Trade discount and Cash Discount. Introduction to Commission and brokerage, Problems on Commission and brokerage Statement and meaning of T.P.methods of finding initial basic feasible solution by North West corner Rule, Matrix Minimum method and Vogel's approximation method. Simple numerical problems. Problems Meaning of LPP, Formulation of LPP, and solution by graphical methods.

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Prof Arude J.B.

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SYLLABUS COMPLETION REPORT
ACADEMIC YEAR-2022-23
Sem-I

Sr. No.	Class	Subject	Name of Teacher
1	F.Y.B.Sc.	Algebra	Prof. Wayal R.M.
		Calculus-I	Prof. Rakshe A.R.
2	S.Y.B.Sc.	Calculus of Several Variable	Prof. Wayal R.M.
		Numerical Analysis & its application	Prof. Wayal R.M.
3	F.Y.B.Cs.	Discrete Mathematics	Prof. Rakshe A.R.
		Matrix Algebra	Prof. Arude J. B.
4	S.Y.B.Cs.	Group and coding theory	Prof. Arude J. B.
		Numerical Techniques	Prof. Rakshe A.R.
5	F.Y.B.Com	Business Mathematics & Statistics	Prof. Bhambure P. D.
6	F.Y.B.B.A.(C.A.)	Business Statistics	Prof. Bhambure P. D.

Class: F.Y.B.Sc

Name: Prof. R. M. Wayal

Subject : Algebra

No. of Lectures:52

Month	Topic	No. of lecture
August	Sets, relation, equivalence relation, equivalence classes, Function.	11
September	Types of function, inverse of function, composition of function, Mathematical induction, division algorithm, greatest common divisor, Euclid's lemma.	12
October	The Euclidean algorithm, fundamental theorem of arithmetic, prime numbers, theory of congruence, properties of congruence.	8
November	Fermat's theorem, sums and products, basic algebraic properties, moduli, complex conjugates. Polar and exponential form of complex number, De-Moivers theorem	17
December	N^{th} root of unity	4

Class: S.Y.B.Sc

Name: Prof. R. M. Wayal

Subject : Calculus of Several Variables

No. of Lectures:41

Month	Topic	No. of lecture
Sept	Functions of two variables, Domain and Range, Graphs, Level Curves.	05
Oct	Functions of Three or More Variables, Limits by using definition, different paths, polar coordinates. Continuity, Definition and examples of partial derivative. Higher Derivatives, Clairaut's Theorem , higher order partial derivative,	13
Nov	Differential, Equations, Wave equation. Differentiable function, Differentials, Chain Rule, homogeneous Functions, Euler's theorem, Extreme values of functions of two variables. Necessary conditions for extreme values. Second Derivative Test, Lagrange Multipliers.	11
Dec	Iterated Integrals, Fubini's Theorem. Double integral over general regions	4
Jan	Change of order of integration for two variables. Double integral in Polar coordinates. Triple integrals, Evaluation of triple integrals. Triple integrals in spherical coordinates. Jacobians, Change of variables in multiple integrals	8

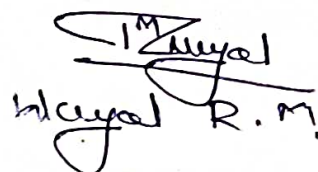
Class - S.Y.B.Sc.

Name:- Prof. R. M. Wayal

Subject:- Numerical Analysis & It's Application

Total No. of lectures - 38

Month	Topic	No. of lecture
September	Errors and their computations, Bisection method.	5
October	The method of False position, Newton- Raphson method, Finite Difference Operators and their relations (Forward, Backward difference and Shift operator). Differences of a polynomial, Newton's forward Interpolation Formula	12
November	Newton's Backward Interpolation Formulae, Lagrange's Interpolation Formula, Numerical Differentiation, A General Quadrature formula, The trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule. . Taylor's series method, Picard's Method successive approximations.	16
December	Euler's & Modified Euler's Methods. Runge Kutta Method (Second and fourth order).	5


Wayal R.M.

	Numerical Integration - A General Quadrature formula, The Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule. Method (First, Second, third and fourth order).	
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Class - F.Y.B.Sc

Name:-Prof. Rakshe A. R.

Subject:- Calculus I

Total No. of lectures - 46

Month	Topic	No. of lecture
August	Algebraic properties of \mathbb{R} , Order properties of \mathbb{R} , Well-Ordering Property of \mathbb{N} , Arithmetic mean-Geometric mean inequality, Bernoulli's inequality, Absolute value function and its properties, triangle inequality and its consequences.	7
September	Definitions of Upper bound, Lower bound, supremum, infimum of subsets of \mathbb{R} , completeness property of \mathbb{R} , Archimedean property and its consequences, The density theorem, sequences of real numbers	10
October	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 - Weierstrass theorem, The Completeness Property of \mathbb{R} .	12
November	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. Properties of continuous functions on an interval, Boundedness theorem, The minimum - maximum theorem,	13
December	Location of root theorem, Bolzano's intermediate value theorem. Continuous function maps closed bounded interval to closed bounded interval.	4

Rakshe

Class - F.Y.B.Cs.(Comp. Sci)

Subject:- Discrete Mathematics

Name:-Prof. Rakshe A.R.

Total No. of lectures per week - 43

Month	Topic	No. of lecture
July 2022	Propositional Logic, Predicates and Quantifiers Rules of Inference, Poset, Hasse diagram. Lattices, Complemented lattice, Bounded lattice and Distributive lattice. Boolean Functions Boolean Function of degree n.	05
August 2022	Boolean identities, Definition of Boolean Algebra. Representation of Minterm, Maxterm Disjunctive normal form, Conjunctive normal Form. Counting Principles Cardinality of a finite set.	11
September 2022	The Product Rule, The Sum Rule, The Inclusion-Exclusion Principle. The Pigeonhole Principle: Statement, The Generalized Pigeonhole Principle, Its applications.	12
October 2022	Permutation and Combination with Repetitions, Permutations with Indistinguishable Objects, Distributing objects into box.	10
November (2022)	Recurrence Relations : Introduction, Formation. Linear Recurrence Relations with constant coefficients. Homogeneous Solutions. Particular Solutions. Total Solutions	05

Class - S.Y.B.Cs.(Comp Sci.)

Subject:- Numerical Techniques

Name:-Prof. Rakshe A.R.

Total No. of lectures - 36

Month	Topic	No. of lecture
Sep 2022	Solution of Algebraic and Transcendental Introduction, Error and their computation Bisection method - without derivation and convergence, The method of false position, Newton - Raphson Method - without derivation & convergence. Interpolation Introduction, Finite difference operators and their relation,	10
Oct 2022	Difference Operators - Forward, Backward, Shift (E), Relations between them. Forward & Backward Difference tables. Factorial notation Newton's Forward Difference & Backward Difference	08
Nov 2022	interpolation Formula (without proof) Lagrange's formula for interpolation with unequally, Divided Difference, Newton's Divided Difference formula. Numerical Integration Introduction. Numerical Differentiation.	18

Class - F.Y.B.Com

Name:- Prof. Bhambure P. D.

Subject:- Business Mathematics & Statistics

Total No. of lectures - 49

Month	Topic	No. of lecture
August	Role of statistics. In informatics business science ,Tabulation	06
September	Data condensations and tabulation, Data Condensation and graphical Methods :Raw data , attributes and variables , classification , frequency distribution ,cumulative frequency distributions. Graphs - Histogram, Frequency polygon. Diagrams - Multiple bar , Pie ,Subdivided bar.	11
October	Criteria for good measures of central tendency, Arithmetic mean, Median and Mode for grouped and ungrouped data, combined mean.	12
November	Concept of dispersion , Absolute and relative measure of dispersion, Range, Variance, Standard deviation, Coefficient of variation, Quartile Deviation , Coefficient of Quartile deviation	12
December	Concept of correlation, positive & negative correlation Karl Pearson's Coefficient of correlation, Meaning of regression, Two regression equations, regression coefficients and properties	8

Class - F.Y.B.Com.

Name:- Prof. Bhambure P. D.

Subject:- Business Mathematics & Statistics

Total No. of lectures - 52

Month	Topic	No. of lecture
August	Interest & Annuity Interest:-Concept of Present value and future value	04
September	simple interest ,compound interest, nominal and effective rate of interest, example and problems. Annuity:- 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	12
October	Shares and Mutual Funds Share :-Concept of share, face value, market value, dividend, brokerage, equity shares, preferential shares, examples and problem. Mutual Funds:- Concept of mutual funds, problems on calculation of net income ,Change in net asset value.	13
November	Population and Sample	12

	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)	
December	Measures of Central Tendency and Measures of Dispersion Frequency distribution : Row data, attributes and variables, classification of data, frequency distribution, cumulative frequency distribution, Histogram and ogive curves. Requisites of ideal, Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean	12
August	Standard Deviation (S.D), Coefficient of variation (C.V)	

~~P. D. Bhambure~~

Prof. P. D. Bhambure