

Fergusson College (Autonomous), Pune

NEP 2.0 Subject Credit Distribution Structure 2024-25

Department of Mathematics (Science)

FYBA Sem-I	Theory/Practical	Paper Code	Paper Title	Credits	Exam Type
Discipline Specific Core DSC	Theory	MTS-1001	Algebra	2	CE+ESE
Discipline Specific Core, DSC	Practical	MTS-1011	Practical 1	2	CE+ESE
Open Elective-1 (For Other faculty)	Theory	MTS-1021	Introduction to Quantitative and Logical Thinking-I	2	Only CE

FYBA Sem-II	Theory/Practical	Paper Code	Paper Title	Credits	Exam Type
Discipline Specific Core DSC-3	Theory	MTS-1002	Calculus	2	CE+ESE
Discipline Specific Core DSC-4	Practical	MTS-1012	Practical 2	2	CE+ESE
Open Elective-2 (For Other faculty)	Theory	MTS-1022	Introduction to Quantitative and Logical Thinking-II	2	Only CE
Skill Enhancement Course, SEC-1	Theory/Practical	MTS-1032	Foundation of Computational Mathematics	2	Only CE

Class: F. Y. B. Sc. Sem. I

Paper Code: MTS-1001

Paper Title: Algebra

Number of Credits:02

Sr.No.	Course Outcome	Blooms Taxonomy Level	Weightage in %
1	CO-1: Remember the properties of sets, functions, operations on matrices	Remember	10
2	CO-2: Understand the nature of function, properties of real numbers	Understand	20
3	CO-3: Apply techniques to find determinant, eigenvalues, eigenvectors. Apply properties of real numbers to find supremum and infimum	Apply	25
4	CO-4: Analyse the matrices and discuss the properties	Analyse	15
5	CO-5: Evaluate the equivalence classes, determinants, eigenvalues and eigenvectors.	Evaluate	20
6	CO-6: Generate the functions with given data, create matrix required conditions, inequalities	Create	10

Unit No.	Title of Unit and Contents	No. of hours
I	Sets, Relations and Functions 1.1 Sets, Operations on Sets, Power Set, Cartesian product of Sets, Graphical representation of sets 1.2 Relations, types of Relations. 1.3 Equivalence relations. 1.4 Partition of a set and equivalence classes. 1.5 Matrix representation and composition of relations. 1.6 Types of functions (One – One, Onto, Bijective).	10
II	Row Echelon Form of Matrices and Applications 2.1 Systems of linear equations 2.2 Row reduction and echelon forms 2.3 The rank of a matrix and applications; 2.4 Matrix operations, 2.5 Determinants, 2.6 The inverse of a matrix, 2.7 Characterizations of invertible matrices; 2.8 Eigen values and eigenvectors, 2.9 The characteristic equation and the Cayley-Hamilton theorem.	10

III	Real Numbers 4.1 Introduction of real numbers 4.2 Well ordering property, inductive property 4.3 Absolute value and its properties 4.4 Completeness property 4.5 Density of rational numbers	10
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Reference Books	<ol style="list-style-type: none"> 1. Robert Bartle, Donald Sherbert, Introduction to Real Analysis (Fourth Edition), John Wiley and Sons Inc. 2. Ajit Kumar, S. Kumaresan and B. K. Sarma, A Foundation Course in Mathematics, Narosa 3. David M. Burton, Elementary number theory, Seventh Edition, Tata McGraw Hill, 2012. 4. Howard Anton, Chris Rorres, Elementary Linear Algebra: Applications Version, Wiley (11th Edition). 5. Bernard Kolman & David R. Hill (2003). <i>Introductory Linear Algebra with Applications</i> (7th edition). Pearson Education Pvt. Ltd. India. 6. David C. Lay, Steven R. Lay & Judi J. McDonald (2016). <i>Linear Algebra and its Applications</i> (5th edition). Pearson Education Pvt. Ltd. India.
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Class: F. Y. B. Sc. Sem. I

Paper Code: MTS-1011

Paper Title: Practical 1

Number of Credits:02

Sr.No.	Course Outcome	Blooms Taxonomy Level	Weightage in %
1	CO-1: Remember the properties of functions, equivalence relation	Remember	10
2	CO-2: Understand the statements and use them in solving the problems	Understand	20
3	CO-3: Apply the definitions and statements to solve the problems	Apply	20
4	CO-4: Analyse the problems and make conclusions	Analyse	20
5	CO-5: Evaluate the equivalence class, eigenvalued, eigenvectors, determinants, supremum	Evaluate	20
6	CO-6: Create the examples for the given data	Create	10

Unit No.	Title of Unit and Contents
1	Applications of properties of sets, Construction of functions, sketching graphs of functions
2	Applications of equivalence relations
3	Congruence relation, Modular arithmetic
4	Construction and properties of bijective functions
5	Applications of partition of set and computation of equivalence classes
6	Application of relation to graphs
7	Applications of system of linear equations
8	Determinants and its applications
9	Applications of eigenvalues and eigenvectors
10	Properties of real numbers, absolute value and applications
11	LUB axioms and its applications
12	Applications of density of rational numbers

Class: F. Y. B. Sc. Sem. I

Paper Code: MTS-1021

Paper Title: Introduction to Quantitative and Logical Thinking-I Number of Credits:02

Sr.No.	Course Outcome	Blooms Taxonomy Level	Weightage in %
1	CO-1:	Understand basic concepts of Integers, Rational and Irrational numbers.	20
2	CO-2:	Familiarize basic concepts of Permutation and Combinations.	15
3	CO-3:	Interpret the concepts of Logical Reasoning Skills	15
4	CO-4:	Solve the problems easily by using short-cut method with time management which will be helpful to them to clear the competitive exams for better job opportunity.	20
5	CO-5:	Analyse the problems logically and approach the problems in a different manner like Probability	20
6	CO-6:	Construct the problems based on Ages	10

Learning Resources:

Reference Books	
	1. R. V. Praveen Quantitative Aptitude and Reasoning, PHI Learning Pvt Ltd
	2. Dinesh Khattar, Quantitative Aptitude for Competitive Examinations, Pearson
	3. R.S. Aggarwal Quantitative Aptitude

Class: F. Y. B. Sc. Sem. II

Paper Code: MTS-1002

Paper Title: Calculus

Number of Credits: 02

Sr.No.	Course Outcome	Blooms Taxonomy Level	Weightage in %
1	CO-1: Remember the definitions and statements	Remember	10
2	CO-2: Understand the theorem to and write the proof	Understand	25
3	CO-3: Apply the statements to solve the problems	Apply	20
4	CO-4: Analyse the statements to define the necessary and sufficient conditions	Analyse	15
5	CO-5: Solve the problems of limit, evaluate the extreme values	Evaluate	20
6	CO-6: Generate the new statements from the given data.	Create	10

Unit No.	Title of Unit and Contents	No. of hours
I	Sequences of Real Numbers 1.1 Sequences of real numbers and convergence of sequences 1.2 Monotone and bounded sequences 1.3 Subsequences	8
II	Limits of functions: 2.1 Cluster point 2.2 Definition of limit 2.3 Limits of some standard functions 2.4 Sequential criteria for limits, 2.5 Uniqueness of limit 2.6 Divergence criteria 2.7 Algebra of limits 2.8 Squeeze theorem for limit	8
III	Continuous functions: 3.1 Definition 3.2 Sequential criteria and examples 3.3 Composition of continuous functions 3.4 Continuous functions on intervals 3.5 Boundedness theorem 3.6 Maximum-Minimum theorem (statement only) 3.7 Location of roots theorem (statement only) 3.8 Intermediate value theorem 3.9 Fixed point theorem 3.10 Preservation of intervals theorem	8
IV	Derivative: 4.1 Definition 4.2 Differentiability imply continuity 4.3 Non differentiable functions 4.4 Algebra of differentiable functions	6

Learning Resources:

Reference Books	1. Robert Bartle, Donald Sherbert, Introduction to Real Analysis (Fourth Edition), John Wiley and Sons Inc. 2. Michael Spivak, Calculus, Cambridge University Press. 3. Thomas' Calculus (14 th edition), Pearson Education. 4. Howard Anton, I. Bivens & Stephan Davis (2016). Calculus (10 th edition). Wiley India. 5. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag.
E-resources	1. E-Books: https://sites.google.com/site/vvacharyanew/ 2. https://studio.youtube.com/channel/UChCsGynvflk4g0DpgvXXvJA/videos

Class: F. Y. B. Sc. Sem. II

Paper Code: MTS-1012
Credits:02

Paper Title: Practical 2

Number of

Sr.No.	Course Outcome	Blooms Taxonomy Level	Weightage in %
1	CO-1: Remember the statements, theorems	Remember	10
2	CO-2: Understand the geometry of functions through statements, examples	Understand	20
3	CO-3: Apply the statements in solving problems	Apply	20
4	CO-4: Analyse the statements, theorems and solve the problems	Analyse	20
5	CO-5: Evaluate limit, critical points, extreme values, etc.	Evaluate	20
6	CO-6: Create counter examples, construct new examples for the desired data.	Create	10

Unit No.	Title of Unit and Contents
1	Evaluation of limit of sequences
2	Monotone sequences and subsequence and applications
3	Continuous functions and their properties
4	Applications of Boundedness theorem
5	Maxima Minima theorem, Intermediate value theorem
6	Applications of fixed-point theorem, preservation of interval theorem
7	Piecewise continuous functions and applications
8	Computation of derivative of function
9	Mean value theorems and applications
10	Increasing and decreasing functions, extreme value, concavity
11	Successive differentiation and applications
12	Taylor's theorem and applications

Class: F. Y. B. Sc. Sem. II

Paper Code: MTS-1022

Paper Title: Introduction to Quantitative and Logical Thinking-II (OE-2)

Number of Credits:02

Sr.No.	Course Outcome	Blooms Taxonomy Level	Weightage in %
1	CO-1:	Understand basic concepts Polynomials, Quadratic equations	15
2	CO-2:	Familiarize basic concepts of simple and compound interest.	20
3	CO-3:	Interpret the Venn diagram	15
4	CO-4:	Solve the problems on Clock Train and Calendar	20

Unit No.	Title of Unit and Contents	No. of hours	
I	1.1 Algebra of Polynomials 1.2 Quadratic Equations 1.3 Partnership 1.4 Simple Interest. 1.5 Compound Interest	10	
II	2.1 Time and Work 2.2 Work and Wages 2.3 Pipes and Cistern 2.4 Allegation 2.5 Problems on Trains	10	
III	3.1 Problems on Clock 3.2 Problems on Calendar 3.3 Time and Distances 3.4 Heights and Distances 3.5 Set and Venn Diagram	10	
5	CO-5:	Analyze the problems on Heights and Distances	20
6	CO-6:	Construct the Venn diagram.	10

Learning Resources:

Reference Books	
	1. R. V. Praveen, Quantitative Aptitude and Reasoning 2. Dinesh Khattar, Quantitative Aptitude for Competitive Examinations-Pearson Education (2020) 3. R.S. Aggarwal Quantitative Aptitude PHI Learning Pvt. Ltd

Class: F. Y. B. Sc. Sem. II

Paper Code: MTS-1032

Paper Title: Foundation of Computational Mathematics (SEC-1)

Number of Credits:02

Sr.No.	Course Outcome	Blooms Taxonomy Level	Weightage in %
1	CO-1: Remember the matrix operations and use it for calculations	Remember	20
2	CO-2: Understand the statement and implement in programming	Understand	20
3	CO-3: Apply statements to solve the problems using software	Apply	20
4	CO-4: Analyse the statement using output of the program	Analyse	10
5	CO-5: Evaluate the determinant, eigenvalues etc. Using the software	Evaluate	20
6	CO-6: Create the statements, problems from the observations.	Create	10

Unit No.	Title of Unit and Contents	No. of hours
I	Statements and Logic 1.1 Introduction of complex numbers, argument, Modulus, De'Moivre's theorem, nth root of complex number 1.2 Statements with quantifiers, Compound Statements, Implications 1.3 Principle of Mathematical Induction 1.4 Integration	10
II	Use of Computational Software for mathematics 2.1 Introduction to computational softwares: Maxima/Scilab/SAGE/Mathematica 2.2 Sketching graph 2.3 Modular arithmetic through software 2.4 Matrix operations, addition, multiplication, inverse, determinant 2.5 System of linear equations, rank of matrix, characteristic polynomial, eigenvalues and eigenvectors 2.6 Complex Numbers: Real and Imaginary parts, modulus, addition, multiplication, argument, power, nth root, solving equations, logarithm	10

III	Calculus using software 3.1 Computation of terms of sequences 3.2 Guess limit of a function from its graph 3.3 Guess limit of a function by evaluation of a function at different points 3.4 Guess limit of a function by evaluation of a function at terms of sequence 3.5 Guess delta for epsilon in the definition of limit 3.6 Continuity of function from graph, sequences 3.7 Bounds for function, maximum values, minimum values, monotone function, location of roots 3.8 Differentiability from the graph, calculation of derivative, monotonicity of a function using derivative, concavity, extreme values. 3.9 Integration using software	10
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E-resources	<ol style="list-style-type: none"> 1. E-Books: https://sites.google.com/site/vvacharyanew/ 2. https://reference.wolfram.com/language/ 3. https://studio.youtube.com/channel/UChCsGynvfLk4g0DpgvXXvJA/videos