S. R. D. S. P. Mandal's

Shri Pancham Khemraj Mahavidyalaya,

Sawantwadi-416510

(Autonomous)

Affiliated to University of Mumbai

Title of the program

B. Sc. (Mathematics)

1. F.Y. B. Sc. 2023-2024
2. S.Y. B. Sc. 2024-2025

Syllabus for

Semester III & Semester IV

Reference: GR dated 16th May 2023 for Credit structure

University of Mumbai

S. R. D. S. P. Mandal's
SHRI PANCHAM KHEMRAJ MAHAVIDYALAYA
SAWANTWADI
(An Autonomous College)
DIST: SINDHUDURG- 416 510, MAHARASHTRA
DEPARTMENT OF MATHEMATICS
Syllabus for Approval

Sr. No.	Heading	Particulars
1.	Title of the Course	S. Y. B. Sc. MATHEMATICS (MINOR COURSE)
2.	Eligibility for Admission	F. Y. B. Sc. MATHEMATICS (MINOR COURSE)
3.	Passing Marks	40%
4.	Ordinance/Regulations (if any)	-
5.	No. of Years/Semesters	Two Semesters
6	Level	UG
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic Year	5.0 Diploma 2024-2025

Date:

HoD,
Dept. of Mathematics

S. R. D. S. P. Mandal's

Shri Pancham Khemraj Mahavidyalaya, Sawantwadi (Autonomous)

Sr. No.	Name of the Faculty	Category	Designation	Signature
01	Dr. Vishwas Pandurang Sonalkar	12.5 (1)	HoD/ Chairman	
02	Miss. Tanvi Dilip Shinde	12.5 (2)	Member	
03	Miss. Gayatri Rajesh Awate		Member	
04	Dr. Kishor D. Kucche	12.5 (3)	Member	
05	Dr. Jervin Zen Lobo		Member	
06	Dr. Shridhar Krishna Pawar	12.5 (4)	Member	
07	Asst. Prof. Sagar Balavant Patil	12.5 (5)	Member	
08	Miss. Shreya Shripad Bhagwat	12.5 (6)	Member	
09	Dr. Subhash Ishwar Unhale	12.5 (7)	Member	

Preamble

1. Introduction:

Shri Pancham Khemraj Mahavidyalaya, Sawantwadi (Autonomous) believes in implementing several measures to bringequity, efficiency and excellence in higher education system in conformity to the guidelines laid down by the University Grants Commission (UGC). In order to achieve these goals, all efforts are made to ensure high standards of education by implementing several steps to enhance the teaching- learning process, examination and evaluation techniques and ensuring the all-round development oflearners.

The institute has brought into force the revised syllabi as per the Choice Based Credit System (CBCS) for the Second year B. Sc. in Mathematics from the academic year 2024-2025. Mathematics has been fundamental to the development of science and technology. In recent decades, the extent of application of Mathematic s to real world problems has increased by leaps and bounds. Taking into consideration the rapid changes in science and technology and new approaches in different areas of mathematics and related subjects like Physics, Statistics and Computer Sciences, the board of studies in Mathematics with concern of teachers of Mathematics from different colleges affiliated to University of Mumbai has prepared the syllabus of S.Y.B. Sc. Mathematics. The present syllabi of S. Y. B. Sc. for Semester III and Semester IV has been designed as per U. G. C. Model curriculum so that the students learn Mathematics needed for these branches, learn basic concepts of Mathematics and are exposed to rigorous methods gently and slowly. The syllabi of S. Y. B. Sc. Mathematics would consist of two semesters and each semester would comprise of two courses. Course I is 'Calculus III and Linear Algebra II'. Calculus is applied and needed in every conceivable branch of science. Course II, 'Linear Algebra II and Numerical Methods' develops mathematical reasoning and logical thinking and has applications in science and technology. The practical course has been designed to help the student have a firm grip on the theoretical concepts through relevant experiments in each course.

2. Aims and Objectives:

- To provide learners sufficient knowledge of fundamental principles, methods and a clear perception of boundless power of mathematical ideas and tools and knowing how to use them by analysing, modelling, solving and interpreting.
- Reflecting on the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.
- Enhancing learners' overall development and to equip them with mathematical modelling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- To enhance knowledge of Mathematics through practicals.

3. Program Outcome: After successful completion of this programme learners will be able to

- Develop the knowledge of basic concepts of different branches of science.
- Basic tricks in Mathematics can be helpful to learners in Competitive Examinations.
- Prepare Learners for prominent career in Industry, Banks and for further Academic study.
- Learners can set up mathematical models of real-world problems and obtain solutions for the same.

4. Program Specific Outcome: After successful completion of this programme learners are able to

- Develop the knowledge of basic concepts of Mathematics.
- Know the Basic tricks in Mathematics which can be helpful to learners in Competitive Examinations.
- Set up mathematical models of real-world problems and obtain solutions for the same.

Credit Structure of the Programme (Sem III & IV)

Semester	Course Code	Title of the Course	Category of Course	Number of Credits
III (Level 5.0)	**S301 MTT (Minor)**	Calculus – III	**Minor**	**2**
	S302 MTT (Minor)	Linear Algebra – I	**Minor**	**2**
	MTOE-303 (GE/OE)	Vedic Mathematics – II	**Open Elective**	**2**
IV (Level 5.0)	**S401 MTT (Minor)**	Linear Algebra – II	**Minor**	**2**
	S402 MTT (Minor)	Numerical Methods	**Minor**	**2**
	MTOE-403 (GE/OE)	Quantitative Aptitude	**Open Elective**	**2**
	MTSE - 404 (SEC)	Practicals of Mathematics	**Skill Enhan.**	**2**

Title of the Programme – B. Sc. Mathematics

Letter Grades and Grade Points:

Semester GPA / Programme CGPA Semester/ Programme	% of Marks	Alpha-Sign/ Letter Grade Result
9.00 - 10.00	90.0 – 100	O (Outstanding)
8.00 - < 9.00	80.0 - < 90.0	A+ (Excellent)
7.00 - < 8.00	70.0 - < 80.0	A (Very Good)
6.00 - < 7.00	60.0 - < 70.0	B+ (Good)
5.50 - < 6.00	55.0 - < 60.0	B (Above Average)
5.00 - < 5.50	50.0 - < 55.0	C (Average)
4.00 - < 5.00	40.0 - < 50.0	P (Pass)
Below 4.00	Below 40.0	F (Fail)
Ab (Absent)	-	Absent

S. Y. B. Sc.

MATHEMATICS (MINOR)

SEMESTER - III

Structure of the Course:

The structure of minor courses (with codes) for Semester -III for S.Y.B.Sc. (Mathematics) NEP-2020 is given below:

MINOR SUBJECTS

Semester	Course Code	Course title	No. of Credits	No. of Lectures In Hours
III	**S301 MTT (Minor)**	Calculus – III	**2**	30
	S302 MTT (Minor)	Linear Algebra – I	**2**	30

SEMESTER – III

Course Title: **- CALCULUS – III**

Course Code: **S301 MTT**

Course Objectives:

(1) Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of innumerous power of mathematical ideas and tools and know how to use them by modeling, solving and interpreting.

(2) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.

(3) 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.

(4) A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.

Course Outcome:

- Calculus – III (Sem III): This course gives introduction to basic concepts of Analysis with rigor and prepares students to study further courses in Analysis.
- Formal proofs are given lot of emphasis in this course which also enhances understanding of the subject of Mathematics as a whole.

UNIT	Description	Number of Lectures
I) Infinite Series	i) Infinite series in R. Definition of convergence and divergence. Basic examples including geometric series, Elementary results such as if $\sum_{n=1}^{\infty} a_n$ is convergent, then $a_n \to 0$ but converse not true. Cauchy Criterion. Algebra of convergent series. ii) Tests for convergence: Comparison Test, Limit Comparison Test, Ratio Test (without proof), Root Test (without proof), Abel Test (without proof) and Dirichlet Test (without proof). Examples. The decimal expansion of real numbers. Convergence of $\sum_{n=1}^{\infty} \frac{1}{n^p}$ $(p > 1)$. Divergence of Harmonic series $\sum_{n=1}^{\infty} \frac{1}{n}$. iii) Alternating series. Leibnitz's Test. Examples.	**10**
II) Riemann Integration and it's Applications	i) Idea of approximating the area under the curve by inscribed and circumscribed rectangles. Partitions of a interval. Refinement of a partition. Upper and Lower sums for a bounded real valued function on a closed and bounded interval. Riemann integrability and the Riemann integral. ii) Area between the two curves. Length of plane curves. Surface area of surfaces of revolution. iii) Continuity of the function $F(x) = \int_a^x f(t)\, dt$, $x \in [a,b]$, when f : $[a,b] \to \mathbb{R}$ is Riemann integrable. First and Second Fundamental Theorems	**10**

	of Calculus. iv) Mean Value theorem. Integration by parts formula.	
III) Higher Order linear differential equations	i) The general n^{th} order linear differential equations, Linear independence. An existence and uniqueness theorem, the Wronskian, Classification: homogeneous and non-homogeneous, General solution of homogeneous and non-homogeneous LDE. The Differential operator and its properties. ii) Higher order homogeneous linear differential equat-ions with constant coefficients, the auxiliary equations, Roots of the auxiliary equations: real and distinct, real and repeated, complex and complex repeated. iii) Higher order homogeneous linear differential equations with constant coefficients, the method of undermined coefficients, method of variation of parameters. iv) The inverse differential operator and particular integral, Evaluation of $\frac{1}{f(D)}$ for the functions like e^{ax}, sin(ax), cos(ax), x^m.	**10**

Recommended Books:

1. R. G. Bartle- D. R. Sherbert, Introduction to Real Analysis, John Wiley & Sons, 1994.
2. Sudhir Ghorpade and Balmohan Limaye, A course in Calculus and Real Analysis, SpringerInternational Ltd, 2000.
3. M. D. Raisinghania, Ordinary and Partial differential equations, S. Chand, Delhi, 2024.

Reference Books:

1. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH, 1964.
2. K. G. Binmore, Mathematical Analysis, Cambridge University Press, 1982.

3. G. F. Simmons, Differential equations with applications and historical notes, McGraw Hill.
4. T. M. Apostol, Calculus Volume **I,** Wiley & Sons (Asia) Pte, Ltd.
5. Richard Courant-Fritz John, A Introduction to Calculus and Analysis, Volume I, Springer.
6. Ajit kumar and S. Kumaresan, A Basic Course in Real Analysis, CRC Press, 2014.
7. James Stewart, Calculus, Third Edition, Brooks/cole Publishing Company, 1994.
8. D. A. Murray, Introductory Course in Differential Equations, Longmans, Green and Co., 1897.
9. A. R. Forsyth, A Treatise on Differential Equations, MacMillan and Co.,1956.

Course Title: **LINEAR ALGEBRA – I**

Course Code: **S302 MTT**

Course Objectives: To introduce students to;

- Understand basic concepts of Linear Algebra.
- Learn the concept of Vector space.
- Learn the concept of Determinants and Linear equations.

Course Outcomes:

- This course gives expositions to system of linear equations and matrices, Vector spaces, Basis and dimension, Linear Transformation.
- This course gives expositions to Inner product space, Eigen values and eigenvectors.
- Prepare learners to get solutions of many kinds of problems in all subjects in science.

UNIT	Description	Number of Lectures
I) System of Equations, Matrices	i) Systems of homogeneous and non-homogeneous linear equations, Simple examples of finding solutions of such systems. Geometric and algebraic understanding of the solutions. ii) Matrices (with real entries), Matrix representation of system of homogeneous and non-homogeneous linear equations. Algebra of solutions of systems of homogeneous linear equations. A system of homogeneous linear equations with number of unknowns more than the number of equations have infinitely many solutions. iii) Elementary row and column operations. Row equivalent matrices. Row reduction (of a Matrix to	**10**

	its row echelon form). Gaussian elimination. Applications to solving systems of linear equations. Examples. iv) Elementary matrices. Relation of elementary row operations with elementary matrices. Invertibility of elementary matrices.	
II) Vector Spaces over R	i) Definition of a vector space over R. Subspaces, Criterion for a nonempty subset to be a subspace of a vector space, Examples of vector spaces, including the Euclidean space R^n, lines, planes and hyperplanes in R^n passing through the origin, space of systems of homogeneous linear equations, space of polynomials, space of various types of Matrices, space of real valued functions on a set. ii) Intersections and sums of subspaces. Direct sums. of vector spaces. Quotient space of a vector space by its subspace. 3. Linear combination of vectors. Linear span of a subset of a vector space. Definition of a finitely generated vector space. Linear dependence and independence of subsets of a vector space.	**10**
III) Determinants, Linear Equations	1. Inductive definition of determinant of a n x n Matrix (e. g. in terms of expansion along the first row). Example of a lower triangular matrix. Laplace expansions along an arbitrary row or column. Determinant expansions using permutations $\left(det\ A = \sum_{\sigma \in S_n} sign(\sigma) \prod_{i=1}^{n} a_{\sigma(i),i} \right)$. 2. Basic properties of determinants (Statements only);	**10**

	(i) det A = det A^T. (ii) Multilinearity and alternating property for columns and rows. (iii) A square matrix A is invertible if and only if det A$\neq$ 0. (iv) Minors and cofactors. Formula for A^{-1} when det A $\neq$ 0. (v) Det (AB) = det A det B. 3. Row space and the column space of a matrix as examples of vector space. Notion of row rank and the column rank. Equivalence of the row rank and the column rank. Invariance of rank upon elementary row or column operations. Examples of computing the rank using row reduction.	

Recommended Books:

1. Serge Lang, Introduction to Linear Algebra, Springer, second Edition, 1997.
2. S. Kumaresan, Linear Algebra - A Geometric Approach, PHI Learning.

Reference Books:

1. Howard Anton, Chris Rorres, Elementary Linear Algebra, Wiley Student Edition).
2. Sheldon Axler, Linear Algebra done right. Springer.
3. Gareth Willias, Linear Algebra with Applications, Jones and Bartlett Publishers.
4. Daid W. Lewis, Matrix theory.

EXAMINATION PATTERN FOR MINOR SUBJECTS

Scheme of Examination for Each Semester:

Continuous Internal Evaluation (CIE): 40 Marks

Sr. No.	Particulars	Marks
01	One Unit Test	20 Marks
02	Home Assignment/ Book Review/ Presentation/Poster/Chart /Model Making	10 Marks
03	Attendance	05 Marks
04	Classroom manners, Etiquette/Subject related activities.	05 Marks
	Total	**40 Marks**

Semester End Examination (SEE): 60 Marks

Duration: 2 hours			**Marks: 60**
	N. B. 1. All questions are compulsory. **2.** Use of simple Calculator is allowed.		
Q. 1 A)	MCQ/Fill in the blanks (out of 8)	Unit – I, Unit – II & Unit – III	06 Marks
Q. 2 A)	Theory Question (Any One out of Two)	Unit - I	08 Marks
Q. 2 B)	Theory/ Examples (Any Two out of Three)		10 Marks
Q. 3 A)	Theory Question (Any One out of Two)	Unit - II	08 Marks
Q. 3 B)	Theory/ Examples (Any Two out of Three)		10 Marks
Q. 4 A)	Theory Question (Any One out of Two)	Unit - III	08 Marks
Q. 4 B)	Theory/ Examples (Any Two out of Three)		10 Marks
	Total		**60 Marks**

Department of Mathematics

Structure for OPEN ELECTIVE COURSE

Semester	Course Code	Title of the Course	Type	Credits
III (Level 5.0)	MTOE-303 (GE/OE)	VEDIC MATHEMATICS - II	Theory	02

Aims and Objectives: After the successful completion of the course, the learner will be able to:

- Understand the Basic concepts in Mathematics.
- Use different tricks to solve the problems of Mathematics in Competitive Examinations.
- To strengthen the ability to draw logical conclusions.

Learning Outcomes:

- Provide a platform to the learners for building the fundamentals of basic mathematics for competitive examinations preparation strategy.
- Establish a framework to help learners acquire knowledge and expertise necessary to secure employment opportunities in the Government sector.

UNIT	Description	Number of Lectures
UNIT 1) Power and Root	Power: (i) Square (two-digit numbers), (ii) Cube (two-digit numbers). Root: (i) Square root (four-digit number). (ii) Cube root (six-digit numbers). (iii) Solution of linear simultaneous equations. Examples on all above methods.	**10**
UNIT 2) Contribution of Indian Mathematicians	Contribution of Indian Mathematicians (In light of Arithmetic) 1. Aryabhatt. 2. Brahmagupt. 3. Mahaveeracharya. 4. Bharti Krishna Tirtha.	**10**
UNIT 3) LCM and HCF	i) Least Common Multiple, Highest Common Factor. Examples. ii) Quadratic Equations, Some basic problems with Vedic Methods. iii) Use of Various Vedic Techniques for Competitive Exams.	**10**

References Books:

1) Sri Bharati Krisna Tirthaji, V. S. Agarwala, Vedic Mathematics or Sixteen Simple Mathematical Formulae from the Vedas, Indological Publishers Delhi, 1981.

2) Gaurav Tekriwal, Maths Sutra: The Art of Vedic Speed Calculation, ISBN 13: 9780143425021, 2015.

3) William Q., Vedic Mathematics Secrets Fun Applications of Vedic Math in Your Everyday Life, 2007.

4) Dhaval Bathia, Vedic Mathematics Made Easy, Jaico Publishing House, 2021.

5) Vedic Mathematics, Motilal Banarsi Das, New Delhi.

6) Vedic Ganita: Vihangama Drishti-1, Siksha Sanskriti Uthana Nyasa, New Delhi.

7) Vedic Ganita Praneta, Siksha Sanskriti Uthana Nyasa, New Delhi.

8) Vedic Mathematics: Past, Present and Future, Siksha Sanskriti Uthana Nyasa, New Delhi.

9) Leelavati, Chokhambba Vidya Bhavan, Varanasi. 6. Bharatiya Mathematicians, Sharda Sanskrit Sansthan, Varanasi.

SYLLABUS

S. Y. B. Sc. MATHEMATICS (MINOR)

SEMESTER - IV

STRUCTURE OF THE COURSE

Semester	Course Code	Course title	No. of Credits	No. of Lectures in Hrs
IV	**S401 MTT (Minor)**	Linear Algebra – II	**2**	30
	S402MTT (Minor)	Numerical Methods	**2**	30

SEMESTER – IV

Course Title: - **Linear Algebra – II**
Course Code: **S401 MTT**

Course Objectives: To introduce students to;

- Understand basic concepts of Linear Transformation.
- Learn the concept of Inner Product Space.
- Understand the concept Eigen values, Eigen vectors and Diagonalizable matrix.

Course Outcomes: After the completion of this course, learners will be able to:

- Understand the concept of Linear Transformation.
- Learn the concept of Inner Product Space using different examples.
- Understand the Eigen values, Eigen vectors and Diagonalizable matrix.

UNIT	Description	Number of Lectures
I) Linear Transformations, Isomorphisms, Matrix associated with L. T.	1. Definition of a linear transformation of vector spaces; elementary properties. Examples. Sums and scalar multiples of linear transformations. Composites of linear transformations. A Linear transformation of $V \to W$ where V, W are vector spaces over $\mathbb{R}$ and V is a finite-dimensional vector space is completely determined by its action on an ordered basis of V. 2. Null-space (kernel) and the image (range) of a linear transformation. Nullity and rank of a linear transformation. Rank-Nullity Theorem (Fundamental Theorem of Homomorphisms). 3. Matrix associated with linear transformation of $V \to W$ where V and W are finite dimensional vector spaces over $\mathbb{R}$. Matrix of the composite of two linear transformations.	**10**

II) Inner Product Space	1. Inner product spaces (over $\mathbb{R}$). Examples, including the Euclidean space $\mathbb{R}^n$ and the space of real valued continuous functions on a closed and bounded interval. Norm associated to an inner product. Cauchy-Schwarz inequality. Triangle inequality. 2. Angle between two vectors. Orthogonality of vectors. Pythagoras theorem and some geometric applications in $\mathbb{R}^2$. Orthogonal sets, Orthonormal sets. Gram-Scmidt orthogonalization process. Orthogonal basis and orthonormal basis for a finite-dimensional inner product space. 3. Orthogonal complement of any set of vectors in an inner product space. Orthogonal complement of a set is a vector subspace of the inner product space.	**10**
III) Eigen values, Eigen vectors and Diagonalizable matrix.	1. Eigenvalues and Eigenvectors of a linear transformation of a vector space into itself and of square Matrices. The eigenvectors corresponding to distinct eigenvalues of a linear transformation are linearly independent. Eigen spaces. Algebraic and geometric multiplicity of an eigenvalue. 2. Characteristic polynomial. Properties of characteristic polynomials (only statements). Examples. Cayley-Hamilton Theorem. Applications. 3. Invariance of the characteristic polynomial and eigenvalues of similar matrices. 4. Diagonalisable matrix. A real square matrix A is diagonalisable if and only if there is a basis of $\mathbb{R}^n$ consisting of eigenvectors of A. (Statement only - A_{nxn} is diagonalisable if and only if sum of algebraic multiplicities is equal to sum of geometric multiplicities of all the eigenvalues of A = n).	**10**

Recommended Books:

1. Serge Lang, Introduction to Linear Algebra, Springer, second Edition, 1997.
2. S. Kumaresan, Linear Algebra - A Geometric Approach, PHI Learning.

Reference Books:

1. Howard Anton, Chris Rorres, Elementary Linear Algebra, Wiley Student Edition).
2. Sheldon Axler, Linear Algebra done right. Springer.
3. Gareth Willias, Linear Algebra with Applications, Jones and Bartlett Publishers.
4. Daid W. Lewis, Matrix theory.

Course Title: **NUMERICAL METHODS**
Course Code: **S402MTT**

Course Objectives: To introduce students to;

- Understand different types of Numerical methods.
- Learn the Interpolation and Curve fitting.
- Understand the different methods of solutions of Linear system of equations.

Course Outcomes: After the completion of this course, learners will be able to:

- Apply different types of Numerical methods in different fields of Mathematics.
- Apply of Interpolation in real life problems.
- Use different methods of solutions of Linear system of equations.

UNIT	Description	Number of Lectures
I) Solutions of Algebraic and Transcendental Equations	i) Measures of Errors: Relative, Absolute and percentage errors, Accuracy and precision: Accuracy to n decimal places, accuracy to n significant digits or significant figures. Rounding and Chopping of a number. Types of Errors: Inherent error. Round-off error and Truncation error. ii) Iteration methods based on first degree equation: Newton-Raphson method, Secant method. Derivations and geometrical interpretation and rate of convergence of all above methods to be covered.	**10**
II) Interpolation, Curve fitting	1. Interpolation: Lagrange's Interpolation. Finite difference operators: Forward Difference, Backward Difference operators Shift operator. Newton's forward difference interpolation formula. Newton's backward	**10**

	difference interpolation formula. Derivations of all above method, to be covered. 2. Curve fitting: linear Curve fitting. Quadratic curve fitting. 3. Numerical Integration: Trapezoidal rule.	
III) Solutions of Linear system of equations, Eigenvalue problems	1. Linear Systems of Equations: LU Decomposition Method (Dolittle's method and Crout's Method). Gass- Seidel Iterative method. 2. Eigenvalue problems: Jacobi’s method for symmetric matrices. Rutishauser method for Arbitrary matrices.	**10**

Recommended Books:

1. Kendall E and Atkinson; An introduction to Numerical Analysis; John Wiley and Sons, second Edition, 1978.
2. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation New Age International Publications, sixth edition, 2012.

References Books:

1. S. Sastry, Introductory methods of Numerical Analysis P'HI Learning Pvt. Ltd. New Delhi, fifth edition, 2012.
2. Sandeep Nagar, Introduction to Scilab: For Engineers and Scientists, first Edition, 2017.
3. S. D. Comte and Carl de Boor; Elementary Numerical Analysis, An algorithmic approach, McGraw-Hill International Book Company, Third Edition,1981.
4. Hildebrand F.B.; Introduction to Numerical Analysis; Dover Publication, NY.
5. Scarborough James B., Numerical Mathematical Analysis; Oxford University Press, New Delhi, Sixth Edition, 2017.
6. Introduction to Scilab, Gilberto E. Urroz, Infoclearinghouse.com, 2011.

SYLLABUS

OPEN ELECTIVE COURSE

CREDIT STRUCTURE

Semester	Course Code	Title of the Course	Category of Course	Number of Credits
IV (Level 5.0)	**MTOE-403**	Quantitative Aptitude	**Open Elective Course**	**02**

Course Objectives: To introduce students to:

- Understand the fundamental properties of numbers.
- Learn the concept of probability.
- Understand the concept of Mensuration and Geometry.

Course Outcomes: After the completion of this course, learners will be able to:

- Understand the fundamental properties of numbers.
- Learn the concept of probability.
- Apply shortcut methods and tricks to solve aptitude problems.

UNIT	Description	Number of Lectures
I) Number System	Real Number System, Properties of Real Numbers, Euclid's division lemma, examples, Decimal representation of rational numbers in terms of terminating/ non-terminating recurring decimals. Calculating square roots, cube roots etc. Simplifications, Inequality.	**10**
II) Probability	Sample space, Events, Types of events, Probability of an event, Examples, Complementary events, Addition theorem of probability conditional probability, independent events. Examples. Random variable.	**10**
III) Mensuration and Geometry	Mensuration, Basic of Geometry, Segments & Angles, Parallel and Perpendicular Lines. Triangle Relationships, Congruent Triangles, Quadrilaterals, Similarity, Polygons and Area, Surface Area and Volume.	**10**

Reference Books:

1) R. S. Aggarwal, Quantitative Aptitude for Competitive Exams, S. Chand Publication, Delhi, 2017.
2) Oswaal Editorial Board, Objective Quantitative Aptitude for All Competitive Examinations Chapter-wise & Topic-wise, 2023.
3) Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, 2013.
4) Arun Sharma, Teach Yourself Quantitative Aptitude for Competitive Exams, Second Edition, Mc-Graw Hill Publication, 2019.
5) Arun Sharma, How to Prepare for Quantitative Aptitude for CAT, Mc-Graw Hill Publication, 2022.
6) S. A. Bari, Practical Business Mathematics, New Literature Publishing Company Bombay, 1971.
7) K. Selva kumar, Mathematics for Commerce Notion Press Chennai, 1st edition 2014.
8) Dinesh Khattar & S. R. Arora, Business Mathematics with Applications, S. Chand Publishing New Delhi, 2001.
9) Operations Research P. K. Gupta & D. S. Hira S. Chand Publishing New Delhi, 2015.

SYLLABUS

SKILL ENHANCEMENT COURSE

CREDIT STRUCTURE

Semester	Course Code	Title of the Course	Category of Course	Number of Credits
IV (Level 5.0)	**MTSE - 404**	**Practicals of Mathematics**	**Skill Enhancement Course (SEC)**	**02**

Course Objectives: To introduce students to;

- Understand the concept Eigen values, Eigen vectors and Diagonalizable matrix.
- Understand different types of Numerical methods.
- Learn the Interpolation and Curve fitting.
- Understand the different methods of solutions of Linear system of equations.

Course Outcomes: After the completion of this course, learners will be able to:

- Understand the Eigen values, Eigen vectors and Diagonalizable matrix.
- Apply different types of Numerical methods in different fields of Mathematics.
- Apply of Interpolation in real life problems.
- Use different methods of solutions of Linear system of equations.

LIST OF PRACTICALS

1.	Linear transformation, Kernel, Image of a Transformation.
2.	Rank-Nullity Theorem.
3.	Linear Isomorphism, Matrix associated with Linear transformations.
4.	Inner product and properties.
5.	Projection, Orthogonal complements.
6.	Orthogonal, orthonormal sets, Gram-Schmidt orthogonalization.
7.	Eigenvalues, Eigenvectors, Characteristic polynomial.
8.	Applications of Cayley Hamilton Theorem.
9.	Diagonalisation of matrix.
10.	orthogonal diagonalisation of symmetric matrix.
11.	Newton-Raphson method, Secant method.
12.	Regula-Falsi method.
13.	Measures of Errors.
14.	Lagrange's Interpolation.
15.	Newton forward and backward difference Interpolation.
16.	Curve fitting, Trapezoidal Rule.
17.	LU decomposition method.
18.	Gauss-Seidel Iterative method.
19.	Jacobi’s method for symmetric matrices.
20.	Rutishauser method for arbitrary matrices.

Recommended Books:

1. Serge Lang, Introduction to Linear Algebra, Springer, second Edition, 1997.
2. S. Kumaresan, Linear Algebra - A Geometric Approach, PHI Learning.
3. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation New Age International Publications, sixth edition, 2012.

Reference Books:

1. Howard Anton, Chris Rorres, Elementary Linear Algebra, Wiley Student Edition.
2. Sheldon Axler, Linear Algebra done right. Springer.
3. Gareth Willias, Linear Algebra with Applications, Jones and Bartlett Publishers.
4. Daid W. Lewis, Matrix theory.
5. Kendall E and Atkinson; An introduction to Numerical Analysis; John Wiley and Sons, second Edition, 1978.
6. S. Sastry, Introductory methods of Numerical Analysis P'HI Learning Pvt. Ltd. New Delhi, fifth edition, 2012.
7. Sandeep Nagar, Introduction to Scilab: For Engineers and Scientists, fi*rst* Edition, 2017.
8. S. D. Comte and Carl de Boor; Elementary Numerical Analysis, An algorithmic approach, McGraw-Hill International Book Company, Third Edition,1981.
9. Hildebrand F.B.; Introduction to Numerical Analysis; Dover Publication, NY.
10. Scarborough James B., Numerical Mathematical Analysis; Oxford University Press, New Delhi, Sixth Edition, 2017.