

4 Year Bachelor of Science/ Arts (MATHEMATICS) CBCS

List of Major Core Courses (MJC):

| Sl. No. | Sem | Course Code | Name of the Course | Credits | Marks |
|-----------------------|------|-------------|---|---------|-------|
| 1. | I | MJC-01 | Algebra | 6 | 100 |
| 2. | II | MJC-02 | Calculus & Geometry | 6 | 100 |
| 3. | III | MJC-03 | Real Analysis | 5 | 100 |
| 4. | III | MJC-04 | Ordinary Differential Equations | 4 | 100 |
| 5. | IV | MJC-05 | Theory of Real Functions | 5 | 100 |
| 6. | IV | MJC-06 | Group Theory | 5 | 100 |
| 7. | IV | MJC-07 | Partial Differential Equations | 5 | 100 |
| 8. | V | MJC-08 | Ring Theory and Linear Algebra-I | 5 | 100 |
| 9. | V | MJC-09 | Multivariate Calculus | 5 | 100 |
| 10. | VI | MJC-10 | Complex Analysis | 4 | 100 |
| 11. | VI | MJC-11 | Metric Space | 5 | 100 |
| 12. | VI | MJC-12 | Riemann Integration and Series of Functions | 5 | 100 |
| 13. | VII | MJC-13 | Ring Theory and Linear Algebra-II | 5 | 100 |
| 14. | VII | MJC-14 | Research Methodology | 5 | 100 |
| 15. | VII | MJC-15 | Numerical Methods | 6 | 100 |
| 16. | VIII | MJC-16 | Mathematical Finance | 4 | 100 |
| Sub Total = 80 | | | | | |

G. D. Singh
14/06/23

Anish
14/6/23

S. V.
14/06/2023

4-Years Bachelor of Science/Arts (MATHEMATICS)

CBCS Syllabus

Semester-I

MJC-01: Algebra (06 credits) (Lecture: 60)

Course Objectives: The primary objective of this course is to introduce the basic tools of theory of equations, complex numbers, number theory and matrices to understand their linkage to the real-world problems.

Course Learning Outcomes: This course will enable the students to:

- i) Employ De Moivre's theorem in a number of applications to solve numerical problems.
- ii) Apply Euclid's algorithm and backwards substitution to find greatest common divisor.
- iii) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.

Course Contents:

Unit 1 (Lecture: 10)
Polar representation of complex numbers, De -Moivre's theorem and its applications, Logarithms of complex quantities, Hyperbolic functions, Gregory series, Summation of series, Resolution into factors.

Unit 2 (Lecture: 12)
Cartesian product of sets, Equivalence relations, partition, partial and total order relation Functions, Composition of functions, Invertible functions, Cardinality of a set, Countable and Uncountable sets, Cantor's theorem,

Unit 3 (Lecture: 12)
Well-ordering property of positive integers, Division algorithm, Euclidean algorithm, Fundamental Theorem of Arithmetic, Modular arithmetic and basic properties of congruences, Principle of mathematical induction.

Unit 4 (Lecture: 12)
Matrices, Operation on Matrices, Kinds of matrices, Transpose, symmetric & skew symmetric Matrices, Hermitian, skew Hermitian Matrices, Adjoint and Inverse of a matrix, orthogonal matrix, Solution of a system of linear equations by matrix methods. Echelon forms, Rank of a matrix.

Grading
14/08/23

14/08/23

14/08/2023

Unit 5

(Lecture: 14)

Fundamental theorem of algebra, Relation between roots and coefficients of a polynomial equation, Symmetric Function of roots, Transformation of equation, Descartes rule of signs, Solution of Cubic equation (Cardon's method) and bi quadratic equation (Euler's method).

References:

1. Dickson, Leonard Eugene (1922). *First Course in The Theory of Equations*. John Wiley & Sons, Inc. New York.
2. Kolman, Bernard, & Hill, David R. (2001). *Introductory Linear Algebra with Applications* (7thed.). Pearson Education, Delhi. First Indian Reprint 2003.

Additional Readings:

1. Andrilli, Stephen, & Hecker, David (2016). *Elementary Linear Algebra* (5thed.). Academic Press, Elsevier India Private Limited.
2. Burton, David M. (2007). *Elementary Number Theory* (7thed.). Tata Mc-Graw Hill Edition, Indian Reprint.
3. K.K.Jha , Advanced Set Theory.Nav BharatPrakashan Patna
4. M.L.Khanna, Theory of Equations, Jai Prakash Nath& Co. Merrut (U.P.)
5. Lalji Prasad, Matrices, Paramount Publications Patna
6. Dasgupta , Trigonometry, Bharti Bhawan Patna.

G. Singh
14/06/23

Mishra
14/6/23

S.N.
14/06/2023