# UNIVERSITY OF LADAKH



**SYLLABUS**
**OF**

**THE FOUNDATION COURSE**
**OF**

**MATHEMATICAL SCIENCE**
**(UNDER NEP – 2020)**

**(Implemented w.e.f Academic Session 2023-24)**

# UNIVERSITY OF LADAKH

**SYLLABI OF THE INTRODUCTORY COURSE IN MATHEMATICAL UNDER
NATIONAL EDUCATION POLICY**

**Semester I**

**Course Title: Fundamental Course I**

**Course Code: MTS-MS-101-C**

**Unit I**
**Introduction to Set Theory**

Sets, operations on sets, Index set and family of sets, Relations, Equivalence relations and partitions, Functions, Composition of functions, Finite and Infinite sets and cardinality, Cantor set, Principle of mathematical induction. Problems and exercises based on this topics.

**Unit II**

**Introduction to Calculus**

Definition of Limit, Properties of Limit, Limits of some elementary functions, Continuity, Properties of continuous function, Continuity of some elementary functions, Definition of derivative, Some general theorems on differentiation (without proof), Derivative of some elementary functions.

Definition and standard elementary integrals, Methods of integration, Integration of the type $\int \sqrt{a^2 - x^2}$, $\int \sqrt{a^2 + x^2}$, $\int \sqrt{x^2 - a^2}$, $\int \frac{1}{\sqrt{a^2-x^2}}$, $\int \frac{1}{\sqrt{a^2+x^2}}$, $\int \frac{1}{\sqrt{x^2-a^2}}$ , Integration by parts, Definite Integrals , Application of integration to area of a region bounded by a curve.

**Unit IV**

**Introduction to divisibility rules**

Greatest common divisors, Least common multiple, Relatively prime, Division algorithm, Euclid's lemma(without proof), The Euclidean algorithm. Problems and exercises based on this topics. Definition of a group with examples and properties, congruence problems.

**Unit V**

**Introduction Statistics I**

Profit and loss, Discount, commission, Brokerage, Rates and Taxes, Insurance, Partnership, Bill of exchange, Stock and shares, Payroll, Simple interest and Compound interest, Frequency, cumulative distribution, Frequency distribution, importance of Diagrammatic and Graph representation of data, frequency polygons and frequency curves, histograms, Ogive curves.

References:

1. Shanti Narayan and P. K. Mittal: A Text Book of Vector Calculus, S. Chand & Company, 1987.
2. P.R. Halmos, Naïve Set Theory, Springer, 1998.
3. Steve Warner, Pure Mathematics for Beginners, Get 800 LLC, 2018.
4. J. G. Chakravorty and P. R. Ghosh: Analytical Geometry and Vector Analysis, U. N. Dhur & Sons Pvt. Ltd, 1973.
5. R. K. Sharma, S. K. Shah and A. G. Shankar: Complex Numbers and the Theory of Equations, Anthem Press , 2011.
6. N. Saran and S. N. Nigam: Introduction to vector analysis, Pothishala publication, Allahabad, 1990.
7. Digital Platform: NPTEL/SWAYAM/MOOCs.
8. T. M. Apostol: Calculus Vol. I, John Willey & Sons, 1999.
9. Gorakh Prasad: Differential Calculus, Pothishala publication, Allahabad, 2016.

10. Gorakh Prasad: Integral Calculus, Pothishala Publication, Allahabad, 2016.
11. M. Ray, H. S. Sharma and S. S. Seth: Differential Calculus, Shiva Lal Agarwal & Company, Agra.
12. . David M. Burton, *Elementary Number Theory* 6th Ed., Tata McGraw-Hill Edition, Indian reprint, 2007
13. Richard E. Klima, Neil Sigmon, Ernest Stitzinger, *Applications of Abstract Algebra with Maple*, CRC Press, Boca Raton, 2000.
14. John B. Fraleigh, *A First Course in Abstract Algebra*, 7th Ed., Pearson, 2002**.**
15. M. Artin, *Abstract Algebra*, 2nd Ed., Pearson, 2011.
16. George E Andrews, *Number Theory*, Hindustan Publishing Corporation, 1984.
17. Neville Robinns, *Beginning Number Theory,* 2nd Ed., Narosa Publishing House Pvt.,Limited, Delhi, 2007.
18. M. Ray, H. S. Sharma and S. S. Seth: Integral Calculus, Shiva Lal Agarwal & Company, Agra.

**Semester II**
**Course Title: Fundamental Course II**
**Course Code: MTS-MS-201-C**

### Unit I

### Introduction to Matrices

Basic concepts of matrices, Types of matrices, Transpose, trace and determinant of a matrix, Elementary operations, Row Reduced echelon form, Rank and inverse of a matrix, Normal form of a matrix, Solutions of a system of linear equations, Characteristic equation of a matrix, eigenvalues, eigenvectors, Cayley-Hamilton theorem(without proof).

### Unit II

### Introduction to Real Number system and Equations with real variable

Real Number system and its properties, Relations between Roots and Coefficients of algebraic equations of real variables, Transformation of equations, Descartes rule of signs, Solutions of Cubic and Bi-quadratic equations.

### Unit III  Introduction to Complex Number System

 Definition; Fundamental operations with complex numbers; Modulus and argument of complex numbers; Geometrical representation of complex numbers; Polar form of complex numbers; De Mover's theorem; Roots of complex numbers; Euler's formula; Polynomial equations; the nth roots of unity.

### Unit IV

### Introduction Statistics II

Definition and Scope of Statistics, Statistical data: Qualitative & Quantitative. Scales of measurement: Nominal, Ordinal, Interval and Ratio. Organization of data, Collection of data, Diagrammatic and Graphical representation of Data. Consistency and independence of data with special reference to attributes.

References:

1.  1. Fuzhen Zhang: Matrix Theory- Basic Results and Techniques, Springer, 1999.
2.  K. B. Dutta: Matrix and Linear Algebra, Prentice Hall of India, 2004.
3.  C. C. MacDuffee: Theory of Equations, John Wiley & Sons, 1954.
4.  William Snow Burnside and Arthur William Panton: The Theory of Equations Vol. I, Nabu  Press, 2011.
5.  Leonard E. Dickson: First Course in the Theory of Equations, Merchant Books, 2009.
6.  R. K. Sharma, S. K. Shah and A. G. Shankar: Complex Numbers and the Theory of Equations, Anthem Press , 2011.
7.  S. C. Gupta and V. K.Kapoor, Fundamentals of Mathematical Statistics
8.  A. M. Goon, M. K. Gupta and B.Dasgupta, Fundamentals of Statistics Vol-I
9.  Bansi Lal and S.Arora, New Mathematical Statistics
10. B. L.Aggarwal, Basic Statistics
11. G. Udny, M. G,Kendal, An Introduction to Theory of Statistics
12. Guide to current Indian Official Statistics, Central Statistical Office, GOI, NewDelhi. 8. http://mospi.nic.in
13. S. Ponnusamy, *Foundations  of Complex Analysis*, Pearson Publication.
14. Goyal and Gupta, *Functions of a complex variable* A Pragati Edition.
15. S.C. Malik and Savita Arora, Mathematical Analysis, New Age International.
16. S. K. Mapa, Introduction to Real Analysis, Levant Books.
17. S. Narayan and M. D. Raisinghania, Elements of Real Analysis, S. Chand