CERTIFICATE PROGRAMME IN VEDIC MATHEMATICS

Duration: 6 Months
Credits: 16 (4×4)
Eligibility: 10+2 or equivalent

Course Objectives

The **Certificate Course in Vedic Mathematics** is designed to empower learners with fast, accurate, and innovative problem-solving skills through the application of ancient Vedic sutras. While exploring India's profound mathematical heritage, the course strengthens computational speed, logical reasoning, and conceptual clarity in arithmetic, algebra, geometry, and trigonometry. Emphasizing both tradition and modern relevance, it equips students with powerful tools for academic excellence, competitive examinations, and practical applications in science and technology. By blending timeless wisdom with contemporary methods, the program nurtures analytical thinking, creativity, and a deeper appreciation of India's enduring contributions to global mathematics.

Target Learners

i. **School & College Students (Class 10 onwards, +2, UG level)**
   - Students who want to strengthen their foundation in mathematics.
   - Those preparing for competitive exams (e.g., JEE, NEET, UPSC, Banking, SSC) where speed and accuracy in calculations are crucial.

ii. **Teachers & Educators**
   - School/college mathematics teachers looking to integrate Vedic methods into their teaching.
   - Educators in coaching institutes who want to provide shortcuts and alternative methods for problem-solving.

iii. **General Learners & Professionals**
   - Parents who wish to guide their children in learning fast arithmetic techniques.
   - Professionals in fields like accounting, finance, data science, and IT who benefit from quick mental calculations.

iv. **Enthusiasts of Indian Knowledge Systems**
   - Learners interested in Ancient Indian Heritage and Sanskrit texts.
   - Students of philosophy, Indology, and cultural studies who wish to explore mathematics in Vedas and ancient texts.

v. **Lifelong Learners & Hobbyists**
   - Anyone keen to improve mental agility, logical thinking, and problem-solving ability through Vedic Mathematics.

Detailed Syllabus:

Course 1: MATHEMATICAL TRADITION IN SANSKRIT

Unit 1: Origin of Mathematics in the Ancient Vedas
Introduction to Vedic Literature, Mathematical Concepts in Vedas, Sulba Sutras

Unit 2: Introduction to Indian Mathematics
Beginning of Ancient Indian Mathematics: General Characteristics**,** Expansion of Ancient Indian, Mathematics and Its Practical Applications**,** Development of Arithmetic in Ancient India, Development of Geometry and Algebra in Ancient India

Unit 3: Features of Vedic Mathematics and the Rule of Three
Brief introduction of Vedic mathematics, importance of Vedic mathematics, Rule of three

Unit 4: Post Vedic Indian Mathematics
Mathematics of Buddhism period, Mathematics of Jainism period

Unit 5: Technical Terms of Mathematics
General introduction to mathematics, technical terms of mathematics: digit, numbers, zero, infinity, decimal, algebra, calculus

Unit 6: Lilavati Part-I: Definition Section
Definition of Mudra, Definition of weight measurement, Masadi-manam (measurement beginning with Masa), Anguladi-manam (Measurement based on Finger), Yojanadi-manam (Measurement based on Distance), Ghanahastadi-manam (Measurement based on volume/capacity), Dronadi-manam (Measurement based on capacity/volume), Yavana-pracarita-manam (Measurement propagated by the Greeks/Foreigners)

Unit 7: Lilavati Part-II: Place Value and Digits
Mangalacharan (Invocation), Places of numbers, arrangement of numbers, Dissemination of the place value and number table system in abroad

Unit 8: Lilavati Part-III: Method of Calculation
The rule of performing addition and subtraction, explanation of addition (sankalita/yoga), explanation of subtraction (viyoga),

Unit 9: Aryabhatta: Ganitapada
Invocation of the Ganga, Understanding of Place value, Definition and nature of square and cube, Method of extracting square and cube roots

Unit 10: Contributions of Classical Mathematicians-I

Aryabhata: Life history, Major Contributions; Influence of Aryabhata on Others, Brahmagupta: Life history, Major Contributions

Unit 11: Contributions of Classical Mathematicians-II
Mahabir Acharya: Life history, Major Contributions; Shripati: Life history, Major Contributions

Unit 12: Evolution of Modern Indian Mathematics
Shridharacharya: Life history, Major Contributions; Srinivasa Ramanujan: Life history, Major Contributions, Bharati Krishna Tirtha: Life history, Major Contributions

Unit 13: Actual Applications of the Vedic Sutras
Applications in Basic Arithmetic, Applications in Algebra, Applications in Polynomial and Higher Calculations

Unit 14: Relevance of Vedic Knowledge in Modern Mathematics
Comparison between vedic and western approaches to arithmetic, algebra and geometry, Applications of Vedic principles to modern problem solving

Course 2: VEDIC ARITHMETIC

Unit 1: Basic Arithmetic through Vedic Sutras

Introduction to Vedic arithmetic, important Vedic sutras for arithmetic, Ekadhikena Purvena

Unit 2: Addition

Vedic addition techniques, Sutras applied in addition, rapid mental addition method

Unit 3: Subtraction

Vedic methods of subtraction, Nikhilam Sutra

Unit 4: Multiplication

Urdhva-Tiryak Sutra, practical application in compound multiplication, practice and proportion in compound multiplication

Unit 5: Division

Nikhilam method, Paravartya method, the remainder theorem, argumental division

Unit 6: Divisibility Rules

Sutras for quick divisibility check, divisibility by single digit numbers, divisibility by two digit numbers

Unit 7: Vedic Methods for LCM

Basic definitions, Vedic method for finding LCM

Unit 8: Vedic methods for HCF

Basic definitions, Vedic method for finding HCF, combined problems of LCM and HCF

Unit 9: Techniques for Square and Square-roots

Dvandva-Yoga (duplex combination process), the Yavadunam sutra, simpler method, the case of even numbers, well known first principles, readily available first data

Unit 10: Techniques for Cube and Cube-roots

Anurupya sutra, the Yavadunam sutra, cube root by method of inspection, Modus operandi, first method

Unit 11: Fractions in Vedic Mathematics

Introduction to fraction, Vinculum and its use in fraction, algebra of fractions

Unit 12: Decimals in Vedic Mathematics

Preliminary, Numbers ending in nine, other endings, multiples of the basic fractions

Unit 13: Arithmetic in the Sulba Sutras

Use of arithmetic for geometric constructions, Ratios, proportions, and scaling, Approximate values used in altar measurements

Unit 14: Vedic Ratio and Proportion

Concept of Ratio, Relevance of ratios in Vedic arithmetic, Concept of proportion, Crosswise method (*Urdhva-Tiryak Sutra*) for proportion

Course 3: VEDIC ALGEBRA AND GEOMETRY

Unit 1: Addition and Subtraction of Algebraic Expressions

Conventional method, Vertical addition method, Ekādhikena Pūrvena, Column/vertical subtraction using Vedic style, Application of Parāvartya Yojayet

Unit 2: Multiplication of Algebraic Expressions

Ekādhikena Pūrvena, Nikhilam Navataścaramam Daśatah, Urdhva Tiryak Sutra

Unit 3: Division of Polynomials

Nikhilam Sutra, Parāvartya Yojayet, Shunyam Saamyasamuccaye,

Unit 4: Factorization Techniques

Factorization of simple quadratics, Factorization of harder quadratics, factorization of cubics

Unit 5: HCF

Greatest common measure (GCM) method, Lopana-Sthapana sutra

Unit 6: Simple Equations

First principle of simple equation, first type of simple equation, second type of simple equation, third and fourth types of simple equation.

Unit 7: Mergers Type of Easy Simple Equation

Paravartya method, extension of merger method, complex merger

Unit 8: Simultaneous Simple Equation

The general formula, special type of equations, second special type of equation

Unit 9: Miscellaneous Simple Equation

First type of miscellaneous equation, Second type of miscellaneous equation, Third type of miscellaneous equation, Fourth type of miscellaneous equation

Unit 10: Quadratic Equation

Basic quadratic equation, first special type (reciprocal), second special type, third special type, fourth special type

Unit 11: Cubic Equations

The Purana method, completing the cubic

Unit 12: Geometry in Vedic Period

Historical Development of Vedic Geometry, Sulba Sutras: Foundations of Vedic Geometry, Geometric Shapes Used in Vedic Rituals

Unit 13: Pythagoras and Apollonius' Theorem

Pythagoras theorem with different proofs, Apollonius’ theorem

Unit 14: Analytical Conics

Equation to the straight line, the general equation and two straight lines, hyperbola and asymptotes

Course 4: Project Work

The objective of the project work in the Certificate Programme in Vedic Mathematics is to enable students to apply Vedic sutras and sub-sutras for solving mathematical problems with greater speed and accuracy while developing logical reasoning and analytical skills. The project aims to promote independent and experiential learning through comparative and application-based study of Vedic and conventional methods. It also seeks to enhance creativity, clarity of mathematical expression, and problem-solving ability, while fostering an appreciation of Vedic Mathematics as an integral part of the Indian Knowledge System, highlighting its historical roots, philosophical foundations, and contribution to India's rich mathematical heritage and contemporary education.

References:

[1] *Vedic Mathematics*, Jagadguru Swami Sri Bharati Krishna Tirthaji Maharaja, Motilal Banarsidass Publishers, New Delhi, **1965**.

[2] *The History of Ancient Indian Mathematics*, C. N. Srinivasiengar, The World Press, Calcutta, 1967.

[3] *The History of Hindu Mathematics*, Asia Publishing House, Bombay, 1962.

[4] *Vedic Mathematics Made Easy*, Dhaval Bathia, Jaico Publishing House, Mumbai, **2014**.

[5] *Essentials of Vedic Mathematics*, Bhaskar Joshi, Vikas Publishing House, New Delhi, **2005**.