Syllabus

for

DIPLOMA

in

VEDIC MATHEMATICS

Session 2025-2026 onwards

Central University of Punjab
Bathinda, Punjab

Diploma in Vedic Mathematics

Program Overview:

Vedic Mathematics offers a revolutionary approach to mathematical calculations, empowering individuals to solve complex problems swiftly and accurately. Rooted in ancient Vedic texts and developed by the eminent Swami Shri Bharti Krishna Tirathaji, this system comprises 16 sutras that unlock the potential for rapid computation across various Mathematical domains. The Diploma Course in Vedic Mathematics is meticulously designed to equip learners with the tools and techniques necessary to excel in numerical mathematics, enhancing their speed, accuracy, and confidence in tackling mathematical challenges.

Program Objectives:

- To unleash the power of Vedic mathematics and foster a deeper understanding of its principles.
- To cultivate proficiency in numerical mathematics, enabling learners to execute arithmetic calculations with ease and precision.
- To instil in learners the ability to apply Vedic mathematics techniques in daily calculations, promoting efficiency and accuracy.
- To prepare learners for competitive examinations by enhancing their numerical aptitude and problem-solving skills.
- To foster the development of concentration visualization, and logical reasoning abilities through the practice of Vedic mathematics.

Course modules:

Introduction to Vedic mathematics: explore the history, principles, and significance of Vedic mathematics with real-life situational problems.

Basic Arithmetic techniques: practice fundamental operations such as addition, subtraction, multiplication, and division using Vedic mathematics.

Numerical Aptitude and Competitive Examination Preparation: Develop strategies to excel in numerical aptitude tests and competitive examinations through the application of Vedic Mathematics principles.

Practical Sessions and Problem Solving: Engage in hands-on exercises and problem-solving sessions to reinforce learning and enhance proficiency in Vedic Mathematics techniques.

Program Outcomes:

Upon completion of the Diploma in Vedic Mathematics, learners will:

- demonstrate proficiency in performing arithmetic calculations swiftly and accurately.

- possess the ability to apply Vedic mathematics techniques to generate tables, solve complex calculations, and calculate square roots and cube roots with confidence.
- develop strong numerical aptitude and problem-solving skills, enabling them to tackle competitive examinations effectively.
- harness the power of Vedic mathematics to enhance concentration, visualization, and logical reasoning abilities.
- acquire specialized knowledge in the applications of Vedic mathematics principles in coding, cryptography, digital signal processing, and other relevant fields.

Career Opportunities:

The Diploma in Vedic Mathematics can lead to a variety of careers, such as:

Mathematics Educator: Teach Vedic mathematics techniques in schools, colleges, and educational institutions to enhance students' mathematical abilities.

Numerical Analyst: Apply Vedic mathematics principles in industries such as finance, data analysis, and engineering to optimize numerical computations.

Cryptography Specialist: Utilize Vedic mathematics sutras in cryptography and internet security to enhance encryption and decryption.

Digital Signal Processing Engineer: Implement Vedic mathematics sutras in DSP algorithms for image processing, audio-video processing, and noise filtering applications.

Competitive Exam Trainer: Prepare students for competitive examinations by imparting Vedic mathematics skills and strategies to improve their numerical aptitude and problem-solving abilities.

Conclusion:

The Diploma in Vedic Mathematics offers a transformative learning experience, equipping learners with invaluable skills that transcend traditional approaches to mathematics. By delving into the rich heritage of Vedic mathematics and its practical applications, graduates emerge as adept problem solvers, equipped to excel in diverse academic and professional domains. Join us on this journey to unlock the boundless potential of Vedic mathematics and embark on a path of mathematical mastery and intellectual growth.

CENTRAL UNIVERSITY OF PUNJAB, BATHINDA

Department of Mathematics and Statistics

Sr. No.	Headings	Particulars
1	Title of the Course	Diploma in Vedic Mathematics
2	Eligibility for Admission	A candidate for being eligible at admission to the Diploma in Vedic Mathematics must have passed the XII standard examination or equivalent from any stream from any State/Central Board of School Education.
3	Intake Capacity	15 students per batch
4	Passing Marks	The candidate must obtain 40% marks in aggregate (average of marks in Internal and End Semester Examinations)
5	Selection/admission criteria	Merit will be prepared on the basis of marks in XII standard
6	Credits	40 credits
7	Duration	1 Year (July to June)
8	Number of Lectures	15 hours/Credit
10	Remuneration of Teacher	He / She must possess skill sets in Vedic Mathematics
11	Teaching Faculty Qualification	As per University / Government Guidelines
12	Level	Diploma
13	Teaching mode	Online / Offline
14	Status	To be implemented from the academic year 2025-26
15	Evaluation Exam Pattern	50% Internal + 50% End Semester Examination, Internal assessment of 25 marks Midterm examination of 25 Marks

		And 50 marks End Semester Examination **Total marks = 100** **Separate heads of passing.** **Minimum 20 / 50 needed for passing the Internal Assessment. Minimum 20/50 needed for passing the End Semester Examination.**

Multiple Entry and Multiple Exit in Certificate/Diploma in Vedic Mathematics

Entry Option:

The direct entry in the second semester in the **Diploma in Vedic Mathematics** may be permitted for those students who have successfully completed the **Certificate Course in Vedic Mathematics** from any recognized university/institute/college provided he/she has studied approximately 70% syllabus of the first semester of the **Diploma in Vedic Mathematics**.

Exit Option:

There shall be one exit option in the Diploma Course for those who have joined the one-year Diploma Course and leave the course after completing the first semester. They will be awarded a certificate in Vedic mathematics. Such candidates have to submit a project report of **Four (04) Credits** on some suitable topic suggested by the concerned supervisor/teacher. The members discussed and suggested the following Certificate Course:

1. **Certificate Course in Vedic Mathematics (CCVM)**: For the candidates who join the one-year Diploma in Vedic Mathematics and leave after completion of the first semester.

Examination pattern and evaluation for Diploma in Vedic Mathematics from the 2025-26 session onwards

Formative Evaluation: Internal assessment shall be 25 marks using two or more methods: tests, open book examinations, assignments, term paper, etc. The mid-semester test shall be a descriptive type with 25 marks, including short answers and essay types. The number of questions and distribution of marks shall be decided by the teachers.

Summative Evaluation: The end semester examination (50 marks), with 70% descriptive type and 30% objective type, shall be conducted at the end of the semester. The objective type shall include one-word/sentence answers, fill-in-the-blanks, MCQS, and matching. The descriptive type shall include short-answer and essay-type questions. The number of questions and distribution of marks shall be decided by the teachers. Questions for exams and tests shall be designed to assess course learning outcomes, along with the focus on knowledge, understanding, application, analysis, synthesis, and evaluation.

Evaluation Criteria of the Project

A. First semester (Based on Project proposal and presentation)

a) Supervisor [50% weightage]

b) Two Members Committee Constituted by HoD [50% weightage]

B. Second semester (Based on Project Work)

a) Continuous assessment, report, presentations, viva voce: Supervisor [50% weightage]

b) Project Report (25 marks), presentation (10 marks), novelty/originality (5 marks) and final viva-voce (10 marks): Two Members Committee Constituted by HoD [Total 50% weightage].

Course-Summary

Diploma in Vedic Mathematics

Semester-I:

Sr. No.	Course Code	Course Title	L	T	P	Cr
1	DVM-101	Vedic Arithmetic-I	3	1	0	4
2	DVM-102	Vedic Algebra-I	3	1	0	4
3	DVM-103	Vedic Geometry-I	3	1	0	4
4	DVM-104	Vedic Combinatorics	3	1	0	4
5	DVM-106	Project Work Part-I	0	0	8	4
		Total	12	4	8	20

Semester-II:

Sr. No.	Course Code	Course Title	L	T	P	Cr
Discipline Elective Course (opt any two of the following)						
1	DVM-201	Vedic Arithmetic-II	3	1	0	4
2	DVM-202	Vedic Algebra-II	3	1	0	4
3	DVM-203	Vedic Geometry-II	3	1	0	4
4	DVM-204	Vedic Mathematics and Data Science	3	1	0	4
5	DVM-205	Vedic Mathematics and Elliptic Curve Cryptography	3	1	0	4
Compulsory courses						
6	DVM-206	Project Work Part-II	0	0	24	12
		Total	6	2	24	20

Detailed Courses

Diploma in Vedic Mathematics

Semester-I

Course Title: Vedic Arithmetic-I

Course Code: DVM-101

Course type: Core

Total Hours: 60

L	T	P	Credits
3	1	0	4

Learning outcomes:

The students will be able to

CLO1: study the history and evolution of Vedic mathematics in arithmetic.

CLO2: explain how Vedic mathematics is magical.

CLO3: learn multiplication of numbers, which is performed in fractions of seconds.

CLO4: study the division algorithm and compute the quotient and remainder in a fraction of a second.

CLO5: learn LCM and HCF by Vedic sutras and division by Vedic sutras.

CLO6: learn the contributions of Indian mathematicians in terms of arithmetic.

Units/ Hours	Contents	Mapping with CLO
I 15 Hours	History and Evolution of Vedic Mathematics, Introduction of Basic Vedic Mathematics Sutras in Addition (Bhaskracharya Vyutkarma) and Multiplication (Special Case, Series of 9, Series of 1, etc.), Tables, etc., Comparison of Standard Methods with Vedic Methods. Introduction to Base, Vinculum Number, Beejank.	CLO1 CLO2
II 15 Hours	Multiplication by Sutras-Ekadhikena Purvena, Ekanyunena Purvena, Urdhva-Tiryagbhyam, Nikhilam Navatashcaramam Dashatah, Anurupyena and Combined Operations, Verifying Answers by Use of Beejank. Power: Square, Applications of Vinculum, Different Squares	CLO3

	Methods (By General Method, Ekadhikena Purvena, Nikhilam Navatascaramam Dashatah). Cube (Two-Digit Numbers and Three-Digit).	
III 15 Hours	Find Quotient and Remainder by Paravartya Yojayet and Nikhilam Navatashcaramam Dashatah. Division by Sutra-Ekadhikena Purvena and Divisibility Tests for 2, 3, …, 19, and General Rule for Dhwajank, Divisibility Test, Factorization of Numbers, Highest Common Factor (HCF) and Least Common Multiple (LCM) (by Sutras- Urdhva-Tiryagbhyam and Vilokanam).	CLO4 CLO5
IV 15 Hours	**Contribution of Indian Mathematicians (In light of Arithmetic)** 1. Aryabhata 2. Brahmagupta	CLO6

TRANSACTION MODE: Lecture/Demonstration/Project Method/ Co Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. S. B. K. Tirtha and V. S. Agrawala, Vedic mathematics (Vol. 10), Motilal Banarsidass Publication, 1992.
2. T. B. Murthy, A modern introduction to ancient Indian mathematics, New Age International, 1993.
3. G. G. Emch, Sridharan, and M. D. Srinivas, Contributions to the history of Indian mathematics (Vol. 3), Springer, 2005.

Suggested Readings:

1. V. Singhal, Vedic Mathematics for All Ages: A Beginners' Guide (Vol. 12), Motilal Banarsidass Publisher, 2007.
2. D. Bhatiya, Vedic Mathematics Made Easy, 2nd Edition, Jaico Publishing House, 2021.
3. Y. Giga, T. Kobayashi, What Mathematics Can Do for You: Essays and Tips from Japanese Industry Leaders, Springer, 2015.
4. A. Gupta, The Power of Vedic Maths, Jaico Publishing House, 2004.

5. A. Kumar, Vedic Mathematics Sutra, Upkar Prakashan, 2010.
6. G. Dattoli, S. Licciardi, and M. Artioli, Vedic Mathematics: A Mathematical Tale from the Ancient Veda to Modern Times, World Scientific, 2021.

Course Title: Vedic Algebra-I

Course Code: DVM-102

Course type: Core

Total Hours: 60

L	T	P	Credits
3	1	0	4

Learning outcomes:

The students will be able to

CLO1: learn multiplication and division of polynomials in a fraction of a second.

CLO2: learn factorization of polynomials, and HCF and LCM of two polynomials.

CLO3: study the solutions of equations in one variable.

CLO4: study the solutions of quadratic equations in one variable.

CLO5: learn the contributions of Indian mathematicians in terms of algebra.

Units/ Hours	Contents	Mapping with CLO
I 15 Hours	Basic Introduction to Vedic Algebra (Beejganit), Polynomials, Addition and Subtraction, Beejank, Multiplication of Polynomials (By Sutra-Urdhva Tiryagbhyam). Division of Polynomial (By Paravartya Yojayet).	CLO1
II 15 Hours	Factorizations of Polynomials (Anurupyena & Urdhva Tiryagbhyam), Highest Common Factor (Lopana Sthapana-Bhayam) and Least Common Multiple of Polynomials.	CLO2
III 15 Hours	Solution of Linear Equations by Paravartya Yojayet and Sunyam Samya Samuccaye, Introduction to Zeros of Polynomials, Factor Theorem, Relation Between Roots and Coefficients. Solutions of Quadratic Equations by Puranapuranabhyam and Adyamadyenantya – Mantyena.	CLO3 CLO4

	Solutions of Quadratic Equations by Sutra Urdhva-Tiryagbhyam & Paravartya Yojayet.	
IV 15 Hours	**Contribution of Indian Mathematicians (In light of Algebra)** 1. Varahmihir 2. Bhaskaracharya	CLO5

TRANSACTION MODE: Lecture/Demonstration/Project Method/ Co Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. S. B. K. Tirtha and V. S. Agrawala, Vedic mathematics (Vol. 10), Motilal Banarsidass Publication, 1992.
2. T. B. Murthy, A modern introduction to ancient Indian mathematics, New Age International, 1993.
3. G. G. Emch, G. G., Sridharan, and M. D. Srinivas, Contributions to the history of Indian mathematics (Vol. 3), Springer, 2005.

Suggested Readings:

1. D. Bhatiya, Vedic Mathematics Made Easy, 2nd Edition, Jaico Publishing House, 2021.
2. Y. Giga, T. Kobayashi, What Mathematics Can Do for You: Essays and Tips from Japanese Industry Leaders, Springer, 2015.
3. A. Gupta, The Power of Vedic Maths, Jaico Publishing House, 2004.
4. R. K. Thakur, The Essentials of Vedic Mathematics, Rupa Publications India, 2013.
5. A. Kumar, Vedic Mathematics Sutra, Upkar Prakashan, 2010.
6. J. T. Glover, Vedic mathematics for schools (Vol. 2), Motilal Banarsidass Publication, 2001.
7. G. Dattoli, S. Licciardi, and M. Artioli, Vedic Mathematics: A Mathematical Tale from the Ancient Veda to Modern Times, World Scientific, 2021.

Course Title: Vedic Geometry-I

Course Code: DVM-103

Course type: Core

Total Hours: 60

L	T	P	Credits
3	1	0	4

Learning outcomes:

The students will be able to

CLO1: learn the Baudhayana number and its properties.

CLO2: describe the trigonometry ratios and their geometric significance.

CLO3: understand the concept of line and angle.

CLO4: learn complex numbers and their properties.

CLO5: learn the contributions of Indian mathematicians in terms of geometry.

Units/ Hours	**Contents**	**Mapping with CLO**
I 15 Hours	Concept of Baudhayana Numbers, Baudhayana Numbers of an Angle, Multiplication of a Constant in a Baudhayana Numbers, Baudhayana Numbers of Complementary Angles, Baudhayana Numbers of Sum and Difference ($\alpha \pm \beta$) of an Angle, Baudhayana Numbers of Half Angle.	CLO1
II 15 Hours	Some Applications of Baudhayana Number, Introductions to Circular Functions, Introduction to Trigonometric Ratios, Trigonometric Identities Using Baudhayana Numbers.	CLO2
III 15 Hours	Geometric Representation of Point, Angle, Line, Complex Number and Vector. Equation of a Line. Different Forms of Equations of a Line. Equation of a Line Which Makes an Angle θ from a Line and Passes Through the Point (X, Y). Angle Between Two Lines. Complex Numbers: Multiplication, Division and Square Root. Vector Multiplication.	CLO3 CLO4
IV 15 Hours	**Contribution of Indian Mathematicians (In the light of Geometry)** 1. Jyesthadeva 2. Baudhayana	CLO5

TRANSACTION MODE: Lecture/Demonstration/Project Method/ Co Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. S. B. K. Tirtha and V. S. Agrawala, Vedic mathematics (Vol. 10), Motilal Banarsidass Publication, 1992.
2. P. P. Ray, The Great Mathematicians of Bharat, Rajmangal Prakashan, 2023.
3. K. V. Sarma, K. Ramasubramanian, M. D. Srinivas and M. S. Sriram, Ganita-Yukti-Bhasa (Rationales Mathematical Astronomy) of Jyesthadeva, Hindustan Book Agency, Springer, 2009.

Suggested Readings:

1. D. Bhatiya, Vedic Mathematics Made Easy, 2nd Edition, Jaico Publishing House, 2021.
2. Y. Giga, T. Kobayashi, What Mathematics Can Do for You: Essays and Tips from Japanese Industry Leaders, Springer, 2015.
3. A. Gupta, The Power of Vedic Maths, Jaico Publishing House, 2004.
4. R. K. Thakur, The Essentials of Vedic Mathematics, Rupa Publications India, 2013.
5. A. Kumar, Vedic Mathematics Sutra, Upkar Prakashan, 2010.
6. S. K. Kapoor, Vedic Mathematics Skills, Lotus Press, 2006.
7. G. Dattoli, S. Licciardi, and M. Artioli, Vedic Mathematics: A Mathematical Tale from the Ancient Veda to Modern Times, World Scientific, 2021.

Course Title: Vedic Combinatorics

L	T	P	Credits
3	1	0	4

Course Code: DVM-104

Course type: Core

Total Hours: 60

Learning outcomes:

The students will be able to

CLO1: study the Chandas sutras of Piṅgala and binary arithmetic.

CLO2: learn the Piṅgala triangle and its applications.

CLO3: learn permutations and combinations and their applications.

CLO4: use of Piṅgala sutras in probability.

CLO5: contributions of Indian mathematicians in the field of combinatorics.

Units/ Hours	Contents	Mapping with CLO
I 15 Hours	History of Chanda's Sutras, Introduction to Chanda's Sutras of Piṅgala, Piṅgala Binary Arithmetic, Basic Introduction to Octal, Hexadecimal, and Decimal Arithmetic. Meaning of Numbers in Indian Tradition.	CLO1
II 15 Hours	Piṅgala Triangle, Arithmetic Applications of Piṅgala Triangle, Applications of Piṅgala Triangle in Other Areas, Arrangements of Data, Introduction to Permutation and Combination, Piṅgala Sutras Related to Permutations and Combinations, Applications of Piṅgala Sutras in Arrangements.	CLO2 CLO3
III 15 Hours	Random Experiments, Sample Space, Events, Inclusive and Exclusive Events, Introduction to Probability, Use of Piṅgala Sutras in Probability, Conditional Probability, Multiplication Law of Probability.	CLO4
IV 15 Hours	**Contribution of Indian Mathematicians (In the light of Combinatorics)** 1. Pāṇini 2. Piṅgala	CLO5

TRANSACTION MODE: Lecture/Demonstration/Project Method/Co-Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. Seshadri, Conjeerveram Srirangachari, Studies in the history of Indian mathematics, Springer, 2010.
2. Emch, Gérard G., Ramaiyengar Sridharan, and M. D. Srinivas, Contributions to the history of Indian mathematics, Vol. 3, Springer, 2005.
3. P. P. Ray, The Great Mathematicians of Bharat, Rajmangal Prakashan, 2023.

Suggested Readings:

1. R. Wilson and J. J. Watkins, Combinatorics: ancient & modern, OUP Oxford, 2013.
2. A. Bhaduri and A. Das, Rediscovery of Vedic and Ancient Bharat, Notion Press, 2024.
3. R. Sridharan, K. S. R. Sridharan, and K. Subramaniam, Representations of Numbers and the Indian Mathematical Tradition of Combinatorial Problem, 2015.

Course Title: Project Work Part I

L	T	P	Credits
0	0	8	4

Course Code: DVM-106

Course type: Skill-Based

Total Hours: 60

Learning outcome: The students will be able to

CLO1: develop an interest in theoretical and practical research.

CLO2: decide on their area of research based on their competency.

CLO3: get theoretical and practical knowledge of a specific area of research.

CLO4: prepare themselves for quality research in any mathematical discipline and allied areas.

Students will prepare a research proposal based on a literature review and extensive student-mentor interactions involving discussions, meetings, and presentations. Each student will submit a research/project proposal for the research work planned for the project, including the origin of the research problem, literature review, hypothesis, objectives, methodology to carry out the planned research work, expected outcomes, and bibliography. Students can carry out Project work in industry, national institutes, or universities in the top 100 NIRF rankings. Group Project may be opted for, with a group consisting of a maximum of four students. These students may work using a single approach or a multidisciplinary approach. Research projects can be undertaken in collaboration with the industry or a group from within or across the discipline.

Transaction mode: Co-Operative learning/ Group discussion/Team teaching/Experimentation/Problem solving/Self-learning.

Semester-II

Course Title: Vedic Arithmetic-II

Course Code: DVM-201

Course type: Core

Total Hours: 60

L	T	P	Credits
3	1	0	4

Learning outcomes:

The students will be able to

CLO1: basic understanding of the Indian numerals and decimal system.

CLO2: explore the computation of division and multiplication of fractions.

CLO3: study the power and roots of numbers.

CLO4: learn sequences and series and their applications.

CLO5: study the contribution of Indian mathematicians in light of arithmetic.

Units/ Hours	Contents	Mapping with CLO
I 15 Hours	Brief Introduction to the History and Evolution of the Indian Numeral System, Decimal System, Introduction to Fractions, Multiplication of Fractions, Division of Fractions, and Recurring Decimals. Computation of the Power of a Number. Introduction to Duplex and Its Applications in Squaring.	CLO1 C106 LO2
II 15 Hours	Problems of Remainder of Product and Power, Problems of Unit Digits, Problems of Last Two Digits of a Product and Power. Percents, Ratios and Proportions. Roots: (I) Square Root (Up to Six Digit Numbers), (II) Cube Root (Up to Six Digit Numbers), Square Root and Cube Root Using Duplex.	CLO3
III 15 Hours	Introduction to Sequence and Series, Some Special Series (Arithmetic Progression, Geometric Progression and Harmonic Progression), Sums of Arithmetic Progression, Geometric Progression and Harmonic Progression, Sum of Series.	CLO4
IV 15	**Contribution of Indian Mathematicians (In light of Arithmetic):**	CLO5

Hours	1. Neelkanth Somayya 2. Mādhava	

TRANSACTION MODE: Lecture/Demonstration/Project Method/ Co Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. S. B. K. Tirtha and V. S. Agrawala, Vedic mathematics (Vol. 10), Motilal Banarsidass Publication, 1992.
2. V. Singhal, Vedic Mathematics for All Ages: A Beginners' Guide (Vol. 12), Motilal Banarsidass Publisher, 2007.
3. K. Ramasubramanian and M.S. Sriram, Tantrasaṅgraha of Nīlakaṇṭha Somayājī, Hindustan Book Agency, Springer, 2011.

Suggested Readings:

1. D. Bhatiya, Vedic Mathematics Made Easy, 2nd Edition, Jaico Publishing House, 2021.
2. G. S. Dattoli, Licciardi, and M. Artioli, Vedic Mathematics: A Mathematical Tale from the Ancient Veda to Modern Times, World Scientific, 2021.
3. Y. Giga, T. Kobayashi, What Mathematics Can Do for You: Essays and Tips from Japanese Industry Leaders, Springer, 2015.
4. A. Gupta, The Power of Vedic Maths, Jaico Publishing House, 2004.
5. R. K. Thakur, The Essentials of Vedic Mathematics, Rupa Publications India, 2013.
6. A. Kumar, Vedic Mathematics Sutra, Upkar Prakashan, 2010.

Course Title: Vedic Algebra-II

Course Code: DVM-202

Course type: Core

Total Hours: 60

L	T	P	Credits
3	1	0	4

Learning outcomes:

The students will be able to

CLO1: learn factorizations of cubic and biquadratic polynomials.

CLO2: study matrices and determinants and their properties.

CLO3: solve the system of linear equations and their geometric significance.

CLO4: contributions of Indian mathematicians in the field of algebra.

Units/ Hours	**Contents**	**Mapping with CLO**
I 15 Hours	Factorizations of Cubic and Biquadratic Polynomials: Relation Between Roots and Coefficients, Remainder Theorem & Application, Algebraic Application of Binomial by Meru-Prastara. Introduction of Partial Fractions, Types of Partial Fraction and Their Solutions, Applications of Partial Fractions.	CLO1
II 15 Hours	Introduction & History of Matrices and Determinants, Types of Matrices and Determinants, Matrices and Determinants of Third Order, Inverse of Matrices, Determinants Properties.	CLO2
III 15 Hours	The Solution of the System of Linear Equations in Two Variables, the Solution of the System of Linear Equations in Three Variables, and the Geometric Interpretation of the Solutions of Linear Equations of Two and Three Variables.	CLO3
IV 15 Hours	**Contribution of Indian Mathematicians (In the light of Algebra)** 1. Narayana Pandita 2. Srinivasa Ramanujan	CLO4

TRANSACTION MODE: Lecture/Demonstration/Project Method/ Co Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. S. Udayan Patankar and S. M. Patankar, Elements of Mathematics, TTU Press, 2018.
2. S. Ramanujan, Collected papers of Srinivasa Ramanujan, Cambridge University Press, 2015.
3. R. Sridharan, K. S. R. Sridharan, and K. Subramaniam, Representations of Numbers and the Indian Mathematical Tradition of Combinatorial Problem, 2015.

Suggested Readings:

1. C Berndt and R. A. Rankin, Ramanujan: Letters and commentary, American Mathematical Society, 1995.
2. Dickson, Elementary theory of equations. J. Wiley & sons, Incorporated, 1914.
3. F. Cajori, An introduction to the modern theory of equations, Macmillan, 1904.
4. R. K. Thakur, The Essentials of Vedic Mathematics, Rupa Publications India, 2013.
5. B. C. Berndt, Number theory in the spirit of Ramanujan (Vol. 34), American Mathematical Soc., 2006.

Course Title: Vedic Geometry -II

Course Code: DVM-203

Course type: Core

Total Hours: 60

L	T	P	Credits
3	1	0	4

Learning outcomes:

The students will be able to

CLO1: learn coordinate geometry and the geometry of conics**.**

CLO2: apply ideas of trigonometry in allied areas

CLO3: learn the differentiability of functions and their applications.

CLO4: study the Integrations and their applications.

CLO5: contributions of Indian mathematicians in terms of geometry.

Units/ Hours	Contents	Mapping with CLO
I 15 Hours	Co-Ordinate Geometry: Angle Between Two Straight Lines, Perpendicular Distance from Point to Line, Internal Division of Line, Equation of Circle, Parabola and Ellipse, Eccentricity, Length of Latus Rectum	CLO1
II 15 Hours	Baudhayana Geometry, Sutras of Baudhayana, Application of Trigonometry, Height and Distance, the Angle of Elevation and Its Applications, the Angle of Depression and Its Applications, Inverse	CLO2 CLO3

	Trigonometric Functions & Their Properties and Applications. Introduction to Limits and Continuity, and Differentiation and Indian Point of View, Derivative of Sums and Products by Urdhva-Tiryagbhyam Method and Ekanyunena Purvena, Applications of Meru-Prastar in Derivative, Applications of Derivatives in Real Life.	
III 15 Hours	Introduction to Integration, Some Basic Formulas and Applications of Integrations, Integration by Parts, and Integrals of Partial Fractions.	CLO4
IV 15 Hours	**Contribution of Indian Mathematicians (In the light of Geometry)** 1. Aryabhata 2. Vaṭeśvara	CLO5

TRANSACTION MODE: Lecture/Demonstration/Project Method/Co-Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. R. S. Thakur, Advanced Vedic Mathematics, Rupa Publication, 2019.
2. W. E. Clark, The Aryabhatiya of Aryabhata: An ancient Indian work on mathematics and astronomy, 1930.

Suggested Readings:

1. Udayan S. Patankar and S. M. Patankar, Elements of Mathematics, TTU Press, 2018.
2. G. Strang, Calculus (Vol. 1), SIAM, 1991.
3. W. J. Gongol, The Aryabhatiya: Foundations of Indian Mathematics, 2003.
4. H. Kern, The Aryabhatiya, Brill Archive, 1874.
5. C. J. Edwards, The historical development of the calculus, Springer Science & Business Media, 2012.
6. M. Spivak, Calculus, Cambridge University Press, 2006.
7. T. S. Amma, Geometry in ancient and medieval India. Motilal Banarsidass Publ., 1999.
8. P. P. Ray, The Great Mathematicians of Bharat, Rajmangal Prakashan, 2023.

Course Title: Vedic Mathematics and Data Science

Course Code: DVM-204

Course type: Core

L	T	P	Credits
3	1	0	4

Total Hours: 60

The students will be able to

CLO1: apply the knowledge of Vedic mathematics to understand some properties of statistics.

CLO2: illustrate various properties of statistics with the help of Vedic mathematics and computer programming.

CLO3: explain the basic concepts of data science and linear algebra.

CLO4: apply the Vedic mathematics sutras to solve linear algebra problems.

CLO5: apply Vedic sutras with data science tools and algorithms to tackle real-world data analysis challenges.

Units/ Hours	**Contents**	**Mapping with CLO**
I 15 Hours	Introduction to Vedic Mathematics, Vedic Mathematics Sutras, and Their Applications in Different Fields. Basics of Statistics, Mean, Median, Mode, Variance, Skewness and Kurtosis, Probability Applying Vedic Mathematics Sutras.	CLO1 CLO2
II 15 Hours	Application of Computation Using Vedic Mathematics Sutras in Statistics: Curve Fitting, Statistical Modelling, Random Variables and Probability Mass/Density Functions, Hypotheses Testing Using F, T and Chi-Test, Linear Regression. Data Visualization and Manipulation.	CLO2
III 15 Hours	Basics of Data Science: Solving Linear Equations Using Vedic Technique, the Solution of Simultaneous Linear Equations in Two Variables Using Vedic Sutras, Solution of Quadratic Equations Using Vedic Mathematics Sutras, Evaluation of Determinants, Inversion of Matrices.	CLO3 CLO4
IV 15 Hours	Optimization in Data Science Using Vedic Mathematics, Linear Algebra for Data Science, Half Spaces, Eigenvalues, Eigenvectors, Solving Data Analysis Problems Using Vedic Sutras.	CLO5

TRANSACTION MODE: Lecture/Demonstration/Project Method/Co-Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. Raghunathan Rengasamy, Shankar Narasimhan, Data Science for Engineers, Computer Science and Engineering, NPTEL IIT Madras, 2019.
2. John Zelle, Python Programming: An Introduction to Computer Science, Franklin, Beedle & Associates, 2016
3. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, 2014.

Suggested Readings:

1. Bhaskaracharya, Beejganitam, Chokhambba Vidya Bhavan, Varanasi, 2022.
2. R. Vershynin, High-dimensional probability: An introduction with applications in data science (Vol. 47), Cambridge University Press, 2018.
3. A. K. Tyagi, Data Science and Data Analytics: Opportunities and Challenges, 2021.
4. P. Haber, T. Lampoltshammer, and M. Mayr, Data Science–Analytics and applications, Springer Fachmedien Wiesbaden, 2017.
5. Bharti Krishna Tirtha, Vedic Mathematics, Motilal Banarsi Das, New Delhi, 2015.

Course Title: Vedic Mathematics and Elliptic Curve Cryptography

Course Code: DVM-205

Course type: Core

Total Hours: 60

L	T	P	Credits
3	1	0	4

The students will be able to

CLO1: understand the basic notion of cryptography and the existence of cryptography.

CLO2: understand the mathematical background of cryptography.

CLO3: study the usages of Vedic Mathematics in elliptic curve cryptography.

CLO4: learn some special types of elliptic curve cryptography by using Vedic Mathematics.

Units/ Hours	Contents	Mapping with

		CLO
I 15 Hours	**Brief Introduction to Cryptography:** Private and Public Key Cryptosystems, Classical Cryptography, Simple Substitution Ciphers, Cryptanalysis of Simple Substitution Ciphers, Cryptography before the Computer Age, Symmetric and Asymmetric Ciphers, An Encoding Scheme and an Encryption Scheme, Symmetric Encryption of Encoded blocks, Examples of Symmetric Ciphers, Transcendental Code Value System	CLO1
II 15 Hours	**Mathematical Background of Elliptic Curve Cryptography:** Weierstrass Equations, Elliptic Curve Isomorphism, Geometric Addition, Algebraic Addition, Scalar Multiplication, Logarithm Problem, Group Order, Cyclic Subgroup, Subgroup Order, Discrete Logarithm Problem, ECDH: Elliptic Curve Diffie-Hellman, ECDSA: Elliptic Curve Digital Signature**.** Mathematical Background to Edwards Elliptic Curves, Hessian Elliptic Curves and Huff Elliptic Curves, Hessian Elliptic Curves and Huff Elliptic Curves.	CLO2
III 15 Hours	Elliptic Curve Cryptography Using Vedic Mathematics, Basic Concept and Matlab Coding of Urdhva-Tiryagbhyam and Dvandva-Yoga Techniques, Projective Homogeneous Coordinate System, Comparison Between Conventional and AIVM Techniques, Some Efficient Algorithms for OHEC and THEC, Result Analysis and Comparison.	CLO3
IV 15 Hours	Projective Coordinate Systems and Elliptic Curve Cryptography Based on Vedic Mathematics, Some Efficient Cryptographic Schemes Using Ancient Indian Vedic Mathematics (AIVM), Comparative Analysis of the Number of Arithmetic Operations in the Various Projective Coordinate Systems, Jacobi Elliptic Curves Based on Vedic Mathematics, Jacobi Intersection Elliptic Curve (JIEC).	CLO4

TRANSACTION MODE: Lecture/Demonstration/Project Method/Co-Operative learning/ Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Text Books:

1. A. Nehra, P. Gupta, and M. Kuma, The elliptic curves Vedic mathematics & cryptography, JEC Publication, 2023.
2. J. Hoffstein, J. Pipher, and J. H. Silverman, An introduction to mathematical cryptography, Springer (India) Pvt. Ltd., 2011

Suggested Readings:

1. V Yaschenko, Cryptography: An Introduction, American Mathematical Society, 2009.
2. G. H. Hardy and E. M. Wright – An Introduction to Theory of Numbers, Oxford University Press, 2008, 6th Ed.
3. J Talbot and D Welsh, Complexity and Cryptography: An Introduction, Cambridge University Press, 2006.
4. J. A. Gallian, Contemporary Abstract Algebra, Narosa Publishing House, New Delhi, 2008.
5. M. Artin, Algebra, 2nd Edition, Prentice Hall of India, Delhi, 2011.
6. I. B. S. Passi and I. S. Luthar, Algebra Vol. I: Groups, Narosa Publishing House, 1996.
7. J. H. Silverman, The arithmetic of elliptic curves, New York: Springer, 2009.
8. A. Enge, Elliptic curves and their applications to cryptography: an introduction, Springer Science & Business Media, 2012.
9. T. R. Shemanske, Modern Cryptography and Elliptic Curves (Vol. 83), American Mathematical Society, 2017.

Course Title: Project Work Part-II

L	T	P	Credits
0	0	24	12

Course Code: DVM-206

Course type: Skill-Based

Learning outcome: The students will be able to

CLO1: gain theoretical and practical knowledge of a specific area of research.

CLO2: have a good understanding of the subject to pursue research in reputed institutions of higher learning.

CLO3: apply theoretical and practical knowledge to solve real-life problems.

CLO4: prepare themselves for collaborative research in India and abroad.

Students will carry out their research work under the supervision of a faculty member. Students will regularly interact with the supervisors through meetings and presentations. After completing the research work, students will complete the Project under the supervisor's guidance. The Project will include a literature review, hypothesis, objectives, methodology, results, discussion, and bibliography.

Credits/ Hours	**Contents**	**Mapping with CLO**
12 Credits	We shall continue to study the topic decided in the first semester in more detail and depth to complete the project work.	CLO1 CLO2 CLO3 CLO4

Transaction mode: Co-Operative learning/ Group discussion/Team teaching/Experimentation/Problem solving/Self-learning.