

Mathematics in India - From Vedic Period to Modern Times - Video course

COURSE OUTLINE

The Course would cover the development of mathematical ideas and techniques, starting from the Vedic period to modern times. While the treatment would be historical, we would be focusing mainly on the mathematical contents of various texts. We would be covering topics such as –the discussion of numbers in the Vedas, details of construction of geometrical figures and altars as given in Sulvasutras, discovery of zero and the place value system, and also details of arithmetic, algebra, geometry, trigonometry and combinatorics, as discussed in the works of Aryabhata, Brahmagupta, Mahavira, Bhaskaracharya and Narayana Pandita. Development of ideas and techniques of calculus and spherical trigonometry as found in the Kerala school of astronomy and mathematics will also be discussed. Detailed proofs of mathematical results as contained in the famous work *Yuktibhasa* will be presented. At the end of the course, we briefly sketch the development of mathematics in modern India, especially highlighting the work of Srinivasa Ramanujan which seems to be in continuation both in methods and philosophy, with several aspects of the older tradition of mathematics in India.

COURSE DETAIL

| Lectures | Topics |
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| 1. | Introductory Overview (MDS) |
| 2. | Mathematics in the Vedas and Sulva Sutras 1 (KR) |
| 3. | Mathematics in the Vedas and Sulva Sutras 2 (KR) |
| 4. | Panini (MDS) |
| 5. | Pingala (MDS) |
| 6. | Mathematics in the Jaina Texts (KR) |
| 7. | Development of Place Value System (KR) |
| 8. | Aryabhatiya of Aryabhata 1(KR) |
| 9. | Aryabhatiya of Aryabhata 2(KR) |
| 10. | Aryabhata and Bhaskara I (KR) |
| 11. | Brahmasphutasiddhanta of Brahmagupta 1 (MSS) |
| 12. | Brahmasphutasiddhanta of Brahmagupta 2 (MSS) |
| 13. | Brahmasphutasiddhanta of Brahmagupta 3(KR) |



NP-TEL

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Mathematics

Pre-requisites:

- Mathematics at +2 level
- Desirable : Sanskrit as second language or Optional subject at the school level.

Additional Reading:

1. K.S.Shukla and K.V.Sarma, Aryabhatiya of Aryabhata, Edited, translated with explanatory notes, INSA, New Delhi, 1976.
2. H.T.Colebrooke, Classics of Indian Mathematics, Algebra, Arithmetic and Mensuration from the Sanscrit of Brahmagupta and Bhaskara, London, 1817; Reprint: Sharada Publishing House, Delhi, 2005.
3. M.Rangacharya, Ganitasarasangraha of Mahaviracharya, with Translation and notes, Govt. of Madras, Madras, 2012.
4. Paramananda Singh, Ganita Kaumudi of Narayana Pandita, Translation and notes in Ganita Bharati, New Delhi, Vols. 20-24, 1998-2001.
5. G.G.Joseph, The Crest of the Peacock : The Non-European Roots of Mathematics, Penguin 1990, 3rd Ed, Princeton, 2011.
6. Kim Plofker, Mathematics in India, Princeton Univ. Press, 2009; Indian Reprint : Hindustan Book Agency, New Delhi, 2012.
7. G.G.Emch, M.D.Srinivas and R.Sridharan, Eds., Contributions to the History of Mathematics in India, Hindustan Book Agency, Delhi, 2005.
8. C.S.Seshadri Ed., Studies in History of Indian Mathematics, Hindustan Book Agency, Delhi, 2011.
9. S.Balachandra Rao, Indian Mathematics and Astronomy : Some Landmarks, 3rd Edn., Bhavan's Gandhi Centre, Bangalore, 2004.
10. C.K.Raju, Cultural Foundations of Mathematics : the Nature of

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| 14. | Bakshali Manuscript (KR) |
| 15. | Ganitasarasangraha of Mahavira 1 (MSS) |
| 16. | Ganitasarasangraha of Mahavira 2 (MSS) |
| 17. | Ganitasarasangraha of Mahavira 3 (MSS) |
| 18. | Development of Combinatorics 1 (MDS) |
| 19. | Development of Combinatorics 2 (MDS) |
| 20. | Lilavati of Bhaskara II 1 (MSS) |
| 21. | Lilavati of Bhaskara II2 (MSS) |
| 22. | Lilavati of Bhaskara III3 (MSS) |
| 23. | Bijaganita of Bhaskara II 1 (MDS) |
| 24. | Bijaganita of Bhaskara II2(MDS) |
| 25. | Ganita Kaumudi of Narayana Pandita 1 (MSS) |
| 26. | Ganita Kaumudi of Narayana Pandita 2 (MSS) |
| 27. | Ganita Kaumudi of Narayana Pandita 3 (MDS) |
| 28. | Magic Squares 1 (KR) |
| 29. | Magic Squares 2 (KR) |
| 30. | Kerala School of Astronomy and Development of Calculus 1 (MDS) |
| 31. | Kerala School of Astronomy and Development of Calculus 2 (MDS) |
| 32. | Computation of Accurate Sine Tables (KR) |
| 33. | Trigonometry and Spherical Trigonometry 1 (MSS) |
| 34. | Trigonometry and Spherical Trigonometry 2 (MSS) |
| 35. | Trigonometry and Spherical Trigonometry 3 (MSS) |

Mathematical Proof and the Transmission of the Calculus from Indian to Europe in the 16th c. CE, Pearson, Delhi, 2007.

11. K.Ramasubramanian and M.S.Sriram, Tantrasangraha of Nilakantha Somayaji, Hindustan Book Agency, 2011; Springer Reprint, 2011.

Coordinators:

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| 36. | Proofs in Indian Mathematics 1(MDS) |
| 37. | Proofs in Indian Mathematics 2(KR) |
| 38. | Proofs in Indian Mathematics 3 (MDS) |
| 39. | Mathematics in Modern India 1(MDS) |
| 40. | Mathematics in Modern India 2 (MDS) |

References:

1. B.Datta and A.N.Singh , History of Hindu Mathematics, 2 parts , Reprint , Bharatiya Kala Prakashan, New Delhi, 2004. Supplementary material revised by K.S.Shukla in issues of Indian Journal of History of Science, INSA, New Delhi, India spread over Vols. 15, 18, 19, 27 and 28,1980-1984.
2. C.N.Srinivasa Iyengar, History of Indian Mathematics, World Press, Calcutta, 1967.
3. T.A.Saraswati Amma, Geometry in Ancient and Medieval India, Motilal Banarsidass, Varanasi, 1079.
4. A.K.Bag, Mathematics in Ancient and Medieval India, Choukhambha, Varanasi, 1979.
5. K.V.Sarma, K.Ramasubramanian, M.D.Srinivas and M.S.Sriram, Ganitayuktibhasa of Jyesthadeva : Rationales in Mathematical Astronomy , Vol.1. Mathematics, Vol.2. Astronomy, Hindustan Book Agency, New Delhi, 2008/2009 ; Springer Reprint, 2009.