Bachelor of Education (B.Ed.)

Title of the Course: Pedagogy 1A: P.1.3A: Mathematics
(Semester: 01)

Credits: 2
MM: 50 (External:35 Internal:15)
Contact Week 15

Introduction of the Course

This course will be the first Stream-based pedagogy course that student-teachers will study to know the nuances of the discipline of mathematics at School level. This course aims to develop an understanding of the pedagogic challenges posed by Mathematics as a broad disciplinary stream. It describes the pedagogic needs of studying mathematics at all stages of school education following the recommendations of the National Education Policy 2020.

Learning Outcomes

After completion of the course, student will be able to:

1. Understand the nature of Mathematical thinking.
2. Express their understanding to Mathematics as a study of patterns.
3. Appreciate the historical roots of development of Mathematical concepts.
4. Comprehend the growth of Ancient mathematics.
5. Using historical perspectives for developing a mathematical thinking in school students

Number of Units: 2 **Weeks 15 = 30 hours**

Unit I: Introduction to Mathematical Thinking (8 weeks = 16 hours)

- Mathematics as study of Patterns of shapes, motion, repeating chance, numerical patterns.
- Understanding Mathematics as a humanly created subject: idea of axioms, postulates and proofs, what is a proof? Different methods of proofs: direct proof, indirect proof, counter examples, proof by induction.
- Societal beliefs related to 'knowing' and 'doing' mathematics.

Unit 2: Historical Perspectives of Mathematics (7 weeks = 14 hours)

- Ancient Indian Mathematics: Vedic Mathematics, Contribution of Indian Mathematicians with emphasis on the works of Aryabhata, Brahmagupta, Bhaskar I, Srinivasa Ramanujan. Using the contributions for building an understanding of mathematics
- Historical evolution of mathematical concepts taught at middle and secondary stages. Using historical perspectives for developing a mathematical thinking in school students

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- Mathematics as an art, music, beauty, and aesthetic experience in Indian context.

Practicum/ Suggested Projects / Assignments (Any One)

- Observe and document the ways in which mathematics is integrated in other disciplines.
- Choose any one topic of Mathematics from secondary school curriculum and make a project on the development of topic historically.
- Visit the architectural designs of Indian Temples and structures. Make a document of the mathematics that is involved in it.
- Interview five children from secondary classroom and ask them about their views on learning mathematics.
- Watch the BBC documentary "Story of One "and describe how the basic tenets of mathematics flourished in various civilizations.

Note: On the basis of the above, the teacher may design his/her own relevant projects/ assignments.

Essential/ Recommended Readings

- Devlin K. (2011). Introduction to Mathematical thinking.
- MESE -001(2003).Teaching and Learning Mathematics. IGNOU series Newman, J. (2003).
- Sautoy, M. du. (2008). The Story of Maths. UK: BBC Four Documentary. (Also available as a book)
- Timothy Gowers (2002). Mathematics: A Very Short Introduction. Oxford University Press
- Wheeler D (1983). Mathematisation matters. For the Learning of Mathematics, 3(1).
- Gandhi, H. (2021). Embracing Ancient Indian Mathematics in the Indian Curriculum. Education in India. Institute of Research in Indian Wisdom (IRIW)NCERT (2012), Pedagogy of Mathematics- Textbook for Two-Year B.Ed Course, New Delhi.
- Thakur, R.K. (). The essential of Vedic Mathematics, Rupa Publications, New Delhi

Additional Readings

- Bishop, A. J. (1988). The interactions of mathematics education with culture. Cultural Dynamics, 1(2), 145–157.
- D'Ambrosio, U. (1985). Ethnomathematics and its place in the history and pedagogy of mathematics. For the Learning of Mathematics, 5(1), 44–48.

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- Kazemi, E., & Stipek, D. (2001).Promoting conceptual thinking in four mathematics classrooms. The Elementary School Journal, 102(1), 59–80.
- Ernest, P. (2009). New philosophy of mathematics: Implications for mathematics education. In B. Greer, S. Mukhopadhyay, A. B. Powell, & S. Nelson-Barber (Eds.), Culturally responsive mathematics education (pp. 43–64). Routledge.
- Gutstein, E. (2007). "And that's just how it starts": Teaching mathematics and developing student agency. Teachers College Record, 109(2), 420–448.
- The World of Mathematics: A Four-Volume Series. Washington Tempus

Teaching Learning Resources (Digital and others): Across Units (If any)

- https://www.youtube.com/watch?v=V6yixyiJcos. Math isn't hard, it's a language | Randy Palisoc | TEDxManhattanBeach
- https://www.youtube.com/watch?v=HnecUrHgTkc: Making sense of Math | Greg Tang | TEDxAmoskeagMillyard
- https://www.youtube.com/watch?v=GTPSnXpqW4E: Mathematics: how do we make it popular and exciting? Keith Devlin answers
- https://www.youtube.com/@haneetgandhi7828: Do you have mathematical eye?

Teaching Learning Process

The course will be taught through interactive pedagogic methods such as classroom discussion, debates, film discussions, critical media analysis, collaborative learning tasks which enhance reading comprehension of core writings in the area and innovative projects. Reflective expression and learning will be encouraged.

Assessment Method

The assessment will be formative in nature and will factor in student participation. Individual and group tasks and assignments will be given. Summative evaluation will be done through end-semester examination.

Key words : Mathematical Patterns, history of Mathematics, Indian Mathematics

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