

DISCIPLINE SPECIFIC ELECTIVE COURSE – DSE 1 C (DSE 1C) MATHEMATICS EDUCATION

Credit distribution, Eligibility and Prerequisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ practice		
Mathematics Education DSE – 1C	4	3	1	0	Completed 4 core courses in education	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- Understanding the nature and conceptual foundations of mathematics;
- Conceptualizing theories of learning mathematics for diverse learners;
- Developing understanding on the theories and methodologies of teaching and learning mathematics;
- Understanding national and international perspectives in mathematics learning and assessment.

Learning Outcomes

After completion of the course student will be able to:

- discuss the nature of mathematics and its relevance in mathematics curriculum;
- define the aims and objectives of teaching mathematics;
- exemplifying theories of mathematics learning in diverse learning contexts;
- develop assessment plan for different stages of learning;
- identify common errors and misconceptions in mathematics learning;
- explore scope of mathematics across the curriculum;
- familiarize with manipulatives and ICT based tools for mathematics learning;
- acquire an understanding of national and international perspectives in mathematics education with special reference to (NEP 2020 and curriculum frameworks based on it: NAS, ASER, PISA, TIMSS).

SYLLABUS OF DSE 1 C

45 Hours

Unit 1: Nature and conceptual foundations of mathematics (12 hours)

- Introduction to nature of mathematics
- Aims and objectives of teaching mathematics
- Nature and scope of mathematics education
- History of mathematics and its relevance in mathematics curriculum

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Unit 2: Theories of learning mathematics for diverse learners (18 hours)

- Theories of mathematics learning (Piaget, Vygotsky; Bruner, Zoltan Dienes, Van Hailley)
- Conceptual underpinnings: Number sense and numeration; Estimation; Ratio-proportional thinking; algebraic thinking; units of measurement; spatial understanding
- Teaching-learning resources (manipulatives and ICT) based on the theories:
- Diagnosis of errors and remediation
- Assessment plans such as rubric based assessment; graded assignments; class test; diagnostic assessment

Unit 3: Assessment: National and International perspectives in mathematics education (15 hours)

- Need and purpose of assessment
- Assessment plans such as rubric based assessment; graded assignments; class test; diagnostic assessment and remediation
- Mathematics learning and its' assessment as mentioned in NEP 2020 and in latest curriculum framework
- National and international assessment frameworks (NSA, ASER, PISA and TIMSS)

Suggested Practicum

- Observe any classroom for a week to ten days and analyze the teaching methods
- Develop math teaching – learning resources for any concept and do its field testing
- Develop timeline of developments in mathematics from ancient times to present times.
- Collect data on errors done by students on any concept from mathematics or any other concept of mathematics and identify error patterns of students
- Prepare a rubric based assessment for a specific class.
- Critically analyze latest report released by (ASER/PISA/NAS/TIMSS) in terms of mathematics learning and achievement.

Practicum/ Suggested Projects / Assignments (Any Two)

- Do classroom observations and analyze the teaching methods
- Develop math teaching - learning resources and do its field testing
- Develop timeline of developments in mathematics from ancient to latest
- Collect data on errors and identify error patterns
- Prepare a rubric based assessment
- Critically analyze latest report released by (ASER/PISA/NAS/TIMSS)

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

Recommended Readings

- Musser, G. L., Peterson, B. E., & Burger, W. F. (2013). *Mathematics for Elementary Teachers: A Contemporary Approach, 10th Edition*. Wiley Global Education.
- Rogers, A., Bragg, L., Cooke, A., Fanshawe, M., & Gronow, M. (2021). *Helping Children Learn Mathematics*.
- Kamii, C. (1999). *Young Children Reinvent Arithmetic: Implications of Piaget's Theory*. Teachers College Press.
- Nunes, T., & Bryant, P. (2021). *Using Mathematics to Understand the World: How Culture Promotes Children's Mathematics*. Routledge.
- National Council of Teacher of Mathematics. *Principles to Actions: Ensuring Mathematical Success for All*. Reston: V.A., 2014.
- Courant, H. R. R., Courant, R., Courant, C. I. O. M. S. R., Robbins, H., Stewart, I., & Robbins, P. O. M. H. (1996). *What is Mathematics: An Elementary Approach to Ideas and Methods*. Oxford University Press, USA.
- Sriraman, B., Ernest, P., & Greer, B. (2009). *Critical Issues in Mathematics Education*. IAP.
- Even, R., & Ball, D. L. (2008). *The Professional Education and Development of Teachers of Mathematics: The 15th ICMI Study*. Springer Science & Business Media.
- English, L. D., & Kirshner, D. (2010). *Handbook of International Research in Mathematics Education*. Routledge.
- Katz, V. J. (2009). *A History of Mathematics: An Introduction*. Addison-Wesley Longman.

Teaching Learning Process

The course will be taught through participative and interactive pedagogy. It is suggested to use group work, classroom discussions, seminar presentations and critical analysis. Reflective discussions on field work will be encouraged.

Assessment Method

Assessment will be formative in nature based on assignments, practicum, learners' participation in individual and group activities. Semester end exam will be conducted as per the examination schedule released by the Examination Branch, University of Delhi.

Key words

Mathematics, Education, Diversity in Learners

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