**Teaching and Learning of Mathematics I**

**Programme(s) in which it is offered: B.Sc.B.Ed. Mathematics**

|  |  |
| --- | --- |
| **Course Category**: Core  | **Schedule of Offering**: Odd |
| **Course Credit Structure:** 4 | **Course Code:** EDM3112 |
| **Total Number of Hours:** 5 | **Contact Hours Per Week:** 5 |
| **Lecture:** 3, 3 | **Tutorial:** 0, 0 |
| **Practical:** 1, 2 | **Medium of Instruction:** English |
| **Date of Revision:** | **Skill Focus:** Employability |
| **Short Name of the Course:** Teaching and Learning of Mathematics I  | **Course Stream *(Only for Minor Courses)*:** |
| **Grading Method:** Regular | **Repeatable:** Credit |
| **Course Level:** Intermediate |  |

**Course Description**

This is a core course for students of B.Sc.B.Ed. Mathematics programme. This course discusses the aims and objectives of teaching mathematics at secondary school level, and the need for and importance of planning lessons. The course engages the students in writing Unit Plans and Lesson Plans, and also practising micro teaching skills.

**Course Introduction**

This course discusses the nature of knowledge in mathematics, contributions of Indian mathematicians, the aims and objectives of teaching mathematics at secondary school level, and the need for and importance of planning lessons. The practicum component of the course engages the prospective teachers taking this course in writing Unit Plans and Lesson Plans, and practising micro teaching skills.

**Course Objective**

The objectives of the course are:

1. To familiarise the learners with the nature of mathematical knowledge at secondary school level
2. To create awareness about the contributions of Indian mathematicians and a sense of appreciation
3. To discuss the need for planning lessons and its importance
4. To encourage divergent thinking in terms of planning and executing a lesson
5. To inculcate and enhance the skills of micro teaching in the prospective teachers

**Course Outcome**

At the end of the course students will be able to:

1. Analyse the nature of knowledge in mathematics.
2. Appreciate the contributions of Indian mathematicians to the knowledge in mathematics.
3. Analyse the aims of teaching mathematics at secondary school level.
4. Prepare a structured Unit Plan for teaching mathematics at secondary school level.
5. Prepare a structured Lesson Plan for teaching mathematics at secondary school level.
6. Write the objectives and learning outcomes for a lesson.
7. Plan and use a suitable teaching strategy that are appropriate to the content and the learners.
8. Plan and execute micro-teaching skills in demonstration lessons.

**PO-CO Mapping**

**PO-CO Mapping Matrix**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CO/PO Mapping | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
| CO1 |  |  |  |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |  |
| CO4 |  |  |  |  |  |  |  |  |
| CO5 |  |  |  |  |  |  |  |  |
| CO6 |  |  |  |  |  |  |  |  |
| CO7 |  |  |  |  |  |  |  |  |
| CO8 |  |  |  |  |  |  |  |  |

**Prerequisites and other constraints**

This course does not require any prerequisite course. This course is offered to all students of B.Sc.B.Ed. Mathematics programme.

**Pedagogy**

The course intends to engage the students in interactive lectures, brainstorming sessions, and group discussions. Frequent group and individual assignments. demonstrations and presentations shall be employed for continuous assessment of the learners.

**Suggested Reading:**

1. Butler and Wren (1965). The Teaching of Secondary Mathematics- Fourth Edition. McGraw Hill Book company.
2. Cooney and others (1975). Dynamics of Teaching Secondary School Mathematics. Boston: Houghton Miffilin.
3. Focus Group Report (2005). Teaching of Mathematics. New Delhi, NCERT.
4. Iglewiez and Stoyle (1973). An Introduction to Mathematical Reasoning. New York, McMillan company.
5. Stillwell (1989). Mathematics and its History - Undergraduate Texts in Mathematics. New York, Springer-Verlag.
6. NCERT. A textbook of Content-Cum-Methodology of Teaching Mathematics. New Delhi, NCERT.
7. NCERT (2012). Pedagogy of Mathematics - Textbook for Two Year B.Ed. Course, New Delhi.
8. Polya (1957). How to Solve It. Doubleday.
9. Davis (1984). Learning Mathematics - The cognitive approach to Mathematics Education. Croom Helm Australia Pvt. Ltd
10. Servas and Varga. Teaching school Mathematics. UNESCO source book.
11. Somashekar, Viswanathappa and James (2014). Methods of Teaching Mathematics. Neelkamal Publications Pvt Ltd.

**Evaluation Pattern**

**Evaluation Matrix**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Continuous InternalAssessment (CIA) Components | Component Type | Weightage Percentage | TotalMarks | Tentative Dates | Course Outcome Mapping |
| Mid-Semester Examination | 50% of CIA | 15 | Around 8th week | 1, 2, 3, 6 |
| Individual Presentation | 25% of CIA | 7.5 | Every two weeks | 4, 5, 6, 7, 8 |
| Assignment | 25% of CIA | 7.5 | Every two weeks | 4, 5, 6, 7 |
| CIA Marks | 100% of CIA (to be converted into 30%) | 30 |  |  |
| ESE  | 70% | 70 | End of the semester | 1, 2, 3, 4, 5, 6, 7, 8 |

**Module Sessions**

**Module 1: Knowledge about Mathematics (15 Hours)**

Nature of mathematics - abstractness, preciseness, brevity, language and symbolism; Nature of mathematical propositions; Quantifiers- necessary and sufficient conditions (one and two way); structure of mathematics- undefined terms, defined terms, definitions, axioms, postulates and theorems; mathematical generalisations and their variants- converse, inverse and contrapositive; Pure and Applied mathematics; Branches of mathematics- Arithmetic, algebra, geometry and their diversities; Mathematization through- observation, conjecturing, hypothesizing, testing and verifying; creation of conceptual knowledge and its importance; creation of procedural knowledge- derivation of laws/ theorems/ generalizations in mathematics; relationship of mathematics among different branches of science; relationship within and among branches of mathematics;

Contributions of Indian and other Mathematicians - Aryabhata, Bhaskara, Brahmagupta, Ramanujan, Guass, Euclid, Descarte, Cantor; Organization of Mathematical content- horizontal and vertical linkage (within and between classes IX and X); linkage between upper primary, secondary and senior secondary mathematics.

**Reading:**

1. Stillwell (1989)
2. NCERT (2012)

**Activities:**

1. Individual presentations
2. Individual assignments

**Module 2: Aims and Objectives of Teaching Mathematics (15 Hours)**

Aims of mathematics - Cultural, disciplinary, moral, social and utilitarian aims; General objectives of teaching mathematics Vis-a-Vis the objectives of secondary education; Major shifts in classroom teaching (societal and technological influence); characteristics of good instructional objectives; Writing learning objectives for different content categories in mathematics.

**Reading:**

1. Somashekar, Viswanathappa and James (2014)
2. Davis (1984)
3. Butler and Wren (1965)

**Activities:**

1. Individual presentations
2. Individual assignments

**Module 3: Planning the Teaching and Learning Process (20 Hours)**

Content analysis of secondary school Mathematics textbooks. Annual plan, Unit plan and Lesson plan - their importance. Various formats for writing unit plan and lesson plan for mathematics, their merits and demerits.

**Practicum:** Planning - Annual plan, Unit plan and Lesson plan in teaching Mathematics.

Writing lesson plans for teaching concepts, proving theorems, and problem solving in prescribed format (5-E Model).

**Reading:**

1. Somashekar, Viswanathappa and James (2014)
2. Davis (1984)
3. Butler and Wren (1965)

**Activities:**

1. Group/individual presentations
2. Individual assignments

**Module 4: Teaching Skills (25 Hours)**

Micro teaching – Introduction to the various types of skills, their significance in planning and executing a lesson.

**Practicum:** Practicing skills of microteaching

* Introducing a lesson
* Explaining a concept
* Stimulus variation
* Illustrating with examples
* Probing questioning
* Reinforcement
* Structuring classroom questions
* Blackboard/Whiteboard skills
* Closing a lesson

**Reading:**

1. Somashekar, Viswanathappa and James (2014)
2. Davis (1984)
3. Butler and Wren (1965)

**Activities:**

1. Demonstrations
2. Peer assessment and reflections

**Note:**

For sessional activities, the student teachers shall choose topics pertaining to secondary school mathematics syllabi (8th, 9th and 10th standard syllabi). These may be chosen from a state board or CBSE syllabus (or from NCERT text books). The following topics are only suggestive:

**Set I:** Number system, Ratio and Proportion, Fractions, Mathematics for Business and Data handling.

**Set II:** Polynomials, Graphical representations of various equations, Factorization.

**Set III:** Lines and angles; Triangles – Congruence and Similarity; Polygons; Analytical Geometry; Trigonometry; Computing using ICT.