

# MATHEMATICS SYLLABUS

## **SEMESTER I**

### **1. Theoretical Base of Teaching Mathematics**

#### **Objectives**

The student teachers:

- Understand the characteristics and development of mathematics.
- Understand and appreciate the role of mathematics in the development of modern society.
- Understand the aims and objectives of teaching secondary school mathematics.
- Develop the ability to write proper instructional objectives for teaching mathematics.
- Understand the importance of objective-based instruction in mathematics education.
- Understand the need, importance and stages of planning instruction in mathematics.
- Develop the ability to plan and design lessons in mathematics by tapping various sources of information.
- Compare the various approaches and techniques of teaching mathematics.
- Develop skill in preparing lessons for teaching mathematics using appropriate approaches and methods
- Develop the ability to plan and design lesson transcript; in tune with models of teaching specially relevant for mathematics
- Acquire the basic skills needed for effective teaching.
- Develop the ability to teach different topics in mathematics by applying most appropriate methods.

#### **Content**

##### **Unit I: Meaning, Significance and Development of Mathematics**

- (a) Mathematics - meaning; nature; structure; language of Mathematics
- (b) Characteristics of mathematics
- (c) Significance of mathematics.
  - (i) Practical considerations - practical utility of mathematics in daily life. (ii) Psychological considerations - Development of intellectual and mental competencies; attitudes and values; cognitive development and the learning of mathematics. (iii) Curricular considerations - Mathematics as the basis for the study of other subjects. (iv) Transfer values of learning mathematics-Transferring of knowledge, power, competencies, values, etc., acquired through the learning of mathematics to the life situations at the time of need.

(d) Development of mathematics. Brief history of the development of mathematics; human needs as a basis of growth of mathematics; role of induction, intuition and logic in mathematical thinking; axiomatic approach; new mathematics; latest developments in mathematics; contributions of eminent mathematicians of the world like Euclid, Pythagorus, Rene-Descartes; an examination of the contributions of India to the development of mathematics with special reference to Ramanujam.

## **Unit II: Objectives**

Instructional objectives and specifications; instructional objectives in cognitive domain, affective domain and psychomotor domain; objectives of mathematics teaching as enumerated in the National Curriculum Framework; writing instructional objectives and specifications for teaching specific topics in mathematics', 'Create' as an objective of teaching mathematics. Objective-based instruction - Need and importance in mathematics instruction.

## **Unit III: Principles and Approaches in Teaching Mathematics**

- 1 Stress on process of learning rather than on knowledge of content
- 2 View that learning as 'learning to learn'
- 3 Concretizing abstract ideas - use of aids; activities and illustrations.
- 4 Questioning - features of good questions and good questioning; reflective questions.
- 5 Motivation - Need and importance; techniques of motivation
- 6 Gradation - Need and importance; techniques of maintaining gradation in content and methodology.
- 7 Correlation - Importance; different types of correlation
- 8 Mastery learning approach - Meaning, instructional strategies leading to mastery.
- 9 Team teaching
- 10 Discussion - Collaborative learning; peer tutoring and learning
- 11 Techniques of individualizing instruction - Homogeneous grouping, supervised study Drill work

## **Unit IV: Theoretical Bases of Teaching Mathematics**

Learning theories of Piaget, Bruner and Gagne. Implications of the learning theories in the teaching of mathematics, Learning as pupil activity; process-oriented approach-stress on 'learning to learn'

## **Unit V: Methods and Approaches in the Teaching and Learning of Mathematics**

Dalton plan, Inductive-Deductive method, Analytic method; Synthetic method; Need for Analytic-Synthetic approach, Laboratory method, Project method, Problem-solving method, Heuristic approach, Deep approach and Surface approach to learning.

[Deep approach](#)

Focusing on concepts applicable to solving the problem, relating previous knowledge to new knowledge, relating knowledge from different sources, organizing and structuring content in a coherent whole. Surface approach, focusing on 'signs', focusing on unrelated parts of the task, memorizing information for assessments, associating facts and concepts unreflectively, failing to distinguish principles from examples.

### **Unit VI: Planning Instruction**

Importance, purpose and stages of planning - Year plan - Meaning, importance and format of a year plan - Unit plan - Meaning, importance and format of a unit plan; writing of unit plans for various units. - Lesson plan - Need and significance; essential aspects of a lesson plan; format of a lesson plan and its description.

### **Unit VII: Skills for effective teaching**

Professional skills of mathematics teacher - Microteaching - Meaning; steps, cycle and characteristics - Simulation - Meaning; steps and characteristics.



## **SEMESTER II**

### **Modern Instructional Strategies - Mathematics**

#### **Objectives**

The student teachers:

Gain competence in using modern psychological theories to devise teaching-learning process

Acquire mastery over development and use of tools of evaluation and interpretation of test results.

Develop an understanding of the new trends in curriculum construction and organisation of Mathematics

Understand the characteristics of a good curriculum and textbook and develop the ability to critically evaluate the secondary school Mathematics textbook

Develop skill in preparing various instructional materials for enhancing the effectiveness of instruction and for remedial teaching

Gain acquaintance with the various aids useful for mathematics teaching and for selecting appropriate ones to suit specific situation

Understand and apply the knowledge of different materials and media used in the teaching of mathematics

Understand the techniques of developing mathematical skills

Develop the ability to organize co-curricular activities relevant to mathematics education

Imbibe a positive attitude and spirit of enquiry towards teaching mathematics.

#### **Content:**

## **Unit I: Mathematics Curriculum**

Curriculum - meaning; new trends in curriculum construction - their application in developing mathematics curriculum. - Principles of curriculum organization. - Study of certain important projects for the development of mathematics curriculum - SMSG, SMP, NCERT curriculum.

## **Unit II: Modern Strategies for Instruction**

Models of teaching - Concept attainment model; Inquiry training model; constructivist model.

Cognitive methods for teaching and learning - cognitive skills in analyzing problems, monitoring progress / reviewing performance on completion of mathematics task - How these skills lead to successful learning and problem-solving.

Teaching and learning of mathematics through critical reflective practice - reflective practice is a discourse; facilitated and energized by experience:

a process that involves a reflective turn; concerned with learning how to account for ourselves; should be understood as a disposition to inquiry; enacted by those who are critical thinkers; a way of decoding a symbolic landscape.

Inductive-deductive strategies for learning geometry

Symbolic method for formation of algebraic principles.

## **Unit III: Instructional Materials**

Textbooks - need and importance; qualities of a good mathematics textbook; critical analysis of the existing mathematics textbook in the secondary schools of Kerala.

Teachers' handbooks - need and importance

Workbooks - need and characteristics

Teaching aids - Significance of teaching aids; improvised aids and their preparation; audio-visual aids, their selection and use.

## **Unit IV- Mathematical Skills**

Computational skills - need and importance; technique of developing.

Geometrical skills - need and importance; technique of developing.

Drawing and interpreting charts and graphs.

## **Unit V: Co-curricular Activities**

Mathematics Library - Importance, maintenance and effective use

Mathematics Laboratory - Importance, maintenance and effective use for the development of students' skills in thinking and generating knowledge.

Mathematics Club - Importance, organization, functioning and execution of various activities.

## **Unit VI: Assessing Student Performance**

Achievement Test - Steps in the construction of an achievement test; its administration and interpretation. Qualities of a good achievement test - qualities; process of determining the qualities; determination of the qualities of the unit test.

Different types of questions - merits and demerits, suggestions for improvement.

Diagnostic test - Distinction between achievement test and diagnostic test; special significance in mathematics education; construction, administration and interpretation; provision of remedial instruction.