PEDAGOGY OF MATHEMATICS
FIRST YEAR / SEMESTER I

OBJECTIVES:

At the end of the course, the student-teachers will be able to
- know the nature and scope of Mathematics.
- comprehend the aims and objectives of teaching Mathematics;
- understand Bloom's Taxonomy of Educational Objectives.
- formulate the general instructional objectives and specific learning outcomes.
- acquire various teaching skills and develop competence in structuring lesson plans;
- practice the skills of micro teaching.
- integration and organisation of Mathematics curriculum;
- explore and apply methods of teaching mathematics.
- apply shortcut techniques to increase speed and accuracy

UNIT I: NATURE, SCOPE AND VALUES OF MATHEMATICS

(15 hours)

Mathematics: Meaning and definition – Nature of Mathematics: Science of Logical Reasoning-Mathematical Language and Symbolism –Pure and Applied Mathematics –Euclidean and   Non-Euclidean Geometry; Modern Mathematics. Characteristics of Mathematics: Precision, accuracy, logical sequence, symbolism, abstractness, Mathematical systems and structure. Educational values; Practical value – Disciplinary value; Cultural value and social values.– Development of concentration –Art of economical living –Power of expression-Self reliance – Attitude of discovery; Understanding of popular literature – Quality of hardwork: The place of Mathematics in everyday life; The place of Mathematics in school curriculum. Mathematics as a science of measurement.

Activity :
1.Practice all the values
2, collection of pictures and articles related to mathematics in every day life and science of measurement.

UNIT - II: AIMS, OBJECTIVES AND TEACHING SKILLS OF MATHEMATICS

(15 hours)

Need- individual ,national, social and significance of teaching Mathematics-Aims and objectives of teaching mathematics for 21st century students – 4 C's: Critical thinking, Communication, Collaboration, Creativity, Practical, Social, disciplinary and Cultural aims - Instructional Objectives: General Instructional Objectives (G.I.Os) and Specific Instructional Objectives (S.I.Os) – Revised Bloom's Taxonomy. Remembering-understand applying, analysis ,evaluation, creativity– Micro Teaching: Origin, Need, Phases, Definition, Characteristics, Process, Cycle, A Plan of action, Advantage of Micro teaching and its Uses-Skills : Explanation, Questioning , Blackboard usage, Reinforcement, Stimulus variation, Introduction and Closure -Link lesson.

Activity: Development the 4C'S

UNIT III: ISSUES IN TEACHING AND LEARNING   (15 hours)

Gender issues - Individual differences, Language problem in learning Mathematics - Nature of subjects, Examination and grading system - Teaching and Learning styles – Classroom behaviour of Teacher and Learner - Difficulties in Learning Mathematics: Dyscalculia -Mathematics Phobia - Dysgraphia - Mathematics Anxiety - Difficulties in handling mathematical instrument - Causes, Problems and its remedial measures . Teacher's qualifications ; Teacher's burden ;Teacher's attitude ; Lack of purpose ; Lack of equipment ; Method of teaching ;Rigors in study ; Large classes ; Practical aspects ; Mathematical language ; syllabus ; Text-books ; The students ; Child – centric approach ; Libraries and Laboratories ; Ban on short –Cut methods ; Examinations.

Activity: Identify the difficulties in learning mathematics and give remedial measures.

UNIT – IV: CURRICULUM IN MATHEMATICS :   (15 hours)

Meaning of Curriculum, Components of curriculum - Principles of curriculum construction - Vertical and Horizontal organisation of curriculum - Process of curriculum organisation: Analysis of needs, Objectives, Formulation of objectives, Selection of

content, Selection of learning experience, Organisation and integration of content -logical ,psychological, topical, spiral and integrated approaches and learning experience and Evaluation Techniques. Methods of Teaching: Analytic, Synthetic, Inductive, Deductive, Heuristic, Problem solving, Project and Laboratory - Activity Based Learning (ABL) - Active Learning Method (ALM) - TIGER Method .

Activity:

1.Apply methods of teaching in schools

2.Prepare ALM

UNIT – V: SHORTCUT TECHNIQUES IN ARITHMETIC OPERATIONS
(15 hours)

Addition –subtraction- multiplication by 9,99,999,9999 etc … - multiply by11,12,13 –square of any numbers starting with 5, ending with 5,6,1- square root of numbers factorization –multiply and divide by 5, 25, 125, 625, 3125, 15625 –solving equations, Partial fractions –sum of numbers

Activity: Apply shortcut techniques develop their divergent thinking

References

➢ Aggarwal, J.C. (2008).Teaching of Mathematics. UP: Vikas Publishing House.

➢ Bagyanathan, D.(2007).Teaching of Mathematics. Chennai: Tamil Nadu Text BookSociety.

➢ Bhasin, Sonia.(2005).Teaching of Mathematics- A practical approach-Mumbai:HimalayaPublishing House.

➢ Bhatia, K.K. (2001). Foundations of teaching learning process. Ludhiana: Tandon Publication.

➢ Ediger,M., & Rao. D.B., (2000).Teaching mathematics successfully.NewDelhi:DiscoveryPublishing House.

➢ Bawa, M.S &Nagpal, B.M., (2010).Developing Teaching Competencies.Viva BooksPrivate limited, New Delhi.

➢ James, Anice. (2009).Skills and strategies of teaching Mathematics. Hyderabad: Neelkamal Publication.

➢ Joyce.,&weil.,(2004).Models of teaching.U.K: Prentice Hall of India.

➢ Kapur, J.N. (2002).Suggested experiments in school Mathematics. New Delhi: AryaBook Depot.

➢ Kulshreshta,A.K. (2008).Teaching of Mathematics. Meerut: R.Lall Books Depot. Mangal, S.K., &Mangal,S. (2005). Essentials of educational technology andmanagement. Meerut: Loyal Book Depot.

➢ NCERT.(2005). NCF for School Educaton. New Delhi: Anmol Publications. Passi, B.K., (1991). Models of teaching.NCERT,New Delhi.

➢ Pratap,N. (2008). Teaching of Mathematics. Meerut: R.Lall Books Depot.

➢ Sharma, R.A. (2008).Technological foundations of education. Meerut: R.Lall BooksDepot.

➢ Sharan, R., & Sharma, M. (2006).Teaching of Mathematics. New Delhi: APH PublishingCorporation.

➢ Sidhu, K.S. (2006).Teaching of Mathematics. New Delhi: Sterling Publishers.

➢ Mathematics Books for standard VI - XII, Tamil Nadu Text Book Corporation,

➢ Government of Tamil Nadu.

➢ Vedic Mathematics Books.

PEDAGOGY OF MATHEMATICS
FIRST YEAR / SEMESTER II

OBJECTIVES:

At the end of the course, the student-teachers will be able to
- know the contributions of different Mathematicians.
- understand issues to teaching and learning
- correlate mathematics with other subjects
- create puzzles and riddles.
- offer mathematical club activities

UNIT I: HISTORY OF MATHEMATICS: (15 hours)
Value of History; the Babyhonians; The Egyptions; The Greeks; The Ionic school; The school of Pythagoreans; The Sophist school; The Platonic school ;The first Alexandrian school; The Romans; The Chienses; The Arabs; Historical reviews of developments; Notation system weights and measures: Logarithms; Computer Mathematics. Some great Mathematicians- Aryabhatta, Bramagupta, Baskara, Ramanujan, Euler, Euclid, Pythagoras, Gauss.

Activity: compare the contributions of Indian and foreign mathematics

UNIT II: THE RELATIONSHIP OF MATHEMATICS WITH OTHER SUBJECTS:
                                                       (15 hours)
Mathematics and Physics; Mathematics and Chemistry ;Mathematics and Biology ; Mathematics and Economics ;Mathematics and Engineering ; Mathematics and Agriculture ; Mathematics and Psychology ; Mathematics and logic ; Mathematics and Philosophy ; Mathematics and Fine Arts: Mathematics in Astronomy – Mathematics in Engineering –Stochastic models –Maths in Bio Informatics.
Activity: Collection relevant pictures and documents for the correlation.

UNIT III: AROUSING AND MAINTAINING INTEREST IN MATHEMATICS – A LIST OF STUDY SUGGESTIONS
                                                       (15 hours)
Principles of meaningful Learning ; Mathematics club ; Intellectual activity ; Applications to other fields of study ; Application to professional fields ; Practical values

; Cultural values ; Recreational values ; Practical work ; The Principle of change ; Physical conditions for study ; Psychological conditions for study ; A list of study suggestions ; Principles of meaningful learning. Mathematics Library. Mathematics Library and the Text Book-Importance of Library ; General School Library ; Mathematics Department Library; The use of Library –The Text Book ; It's importance – How to use the text book ; Essentials of a good Text –Book. Riddles, Puzzles, paradoxes-types of paradox, beautiful number patterns, magic squares.

Activity: Preparation of beautiful number pattern
                   Preparation of different AV Aids

UNIT IV: EXPLORING LEARNERS AND RECREATIONAL MATHEMATICS: (15 hours)

Edgar dale's cone of experience -Need and importance of Audio Visual aids – Types of Audio Visual Aids - Projected aids: Over Head Projector, LCD projector, Epidiascope and Slide Projector - Non Projected Aids: Charts, Flash Cards, Print Materials, Regalia and Models. Types of Board: Bulletin Board, Magnetic Board, Flannel Board, Interactive Board and Smart Board - Graphic Aids - Activity Aids- Mathematics Lab .

Activity: Project on Riddles and Puzzles.

UNIT V- MACRO TEACHING

Unit Plan - Year Plan - Lesson Plan: Need and importance, Characteristics of good Lesson Plan, Herbartian steps, Format of a typical Lesson plan - G.I.Os and S.I.Os, Teaching Learning Materials, Motivation, Presentation, Application, Recapitulation and Assignment –Uses of Lesson plan - Organisation of Practice –Teaching Programme for B.Ed., Student-teachers - Role of the Supervisor, Principal and the Academic Staff in the Conduct of Practice - Teaching Programme - General Teaching Competence Scale, Self-Appraisal Scale, Guidelines for Peer Observation and Framework of Evaluation.

Activity:
1.Practice skills in micro teaching
2.Write lesson plans

References

- Aggarwal, J.C. (2008).Teaching of Mathematics. UP: Vikas Publishing House.
- Bagyanathan, D.(2007).Teaching of Mathematics. Chennai: Tamil Nadu Text BookSociety.
- Ediger,M., & Rao. D.B., (2000).Teaching mathematics successfully.NewDelhi:DiscoveryPublishing House.
- Bawa, M.S &Nagpal, B.M., (2010).Developing Teaching Competencies.Viva BooksPrivate limited, New Delhi.
- James, Anice. (2009).Skills and strategies of teaching Mathematics. Hyderabad: Neelkamal Publication.
- Joyce.,&weil.,(2004).Models of teaching.U.K: Prentice Hall of India.
- Kapur, J.N. (2002).Suggested experiments in school Mathematics. New Delhi: AryaBook Depot.
- Kulshreshta,A.K. (2008).Teaching of Mathematics. Meerut: R.Lall Books Depot. Mangal, S.K., &Mangal,S. (2005). Essentials of educational technology andmanagement. Meerut: Loyal Book Depot.
- NCERT.(2005). NCF for School Educaton. New Delhi: Anmol Publications. Passi, B.K., (1991). Models of teaching.NCERT,New Delhi.
- Pratap,N. (2008). Teaching of Mathematics. Meerut: R.Lall Books Depot.
- Sharma, R.A. (2008).Technological foundations of education. Meerut: R.Lall BooksDepot.
- Sidhu, K.S. (2006).Teaching of Mathematics. New Delhi: Sterling Publishers.
- Mathematics Books for standard VI - XII, Tamil Nadu Text Book Corporation, Government of Tamil Nadu.

PEDAGOGY OF MATHEMATICS
SEMESTER III

OBJECTIVES:

At the end of the course, the student-teachers will be able to

-

UNIT- I: SENSITISING THE SCHOOL CURRICULUM (15 hours)

Analysis of the Content course of Standard VI to VIII (Mathematics) Text Books prescribed by Government of Tamil Nadu, and content course of standard IX - X (for UG), XI – XII (for PG) Mathematics Text Books Prescribed by Government of Tamil Nadu.

UNIT - II:MATHEMATICS CURRICULUM AT SCHOOL LEVEL (15 hours)

The Dynamic Approach to Curriculum –The teacher concern; Objectives of Curriculum –As a means to an end. Flexibility –Why revision: Who should organize and revise; Principles of construction ;Criterion of preparatory value ; Criterion of Disciplinary value – Use is the chief criterion ; Child centric curriculum ; A comprehensive curriculum ; Psychological and logical Arrangement ; Scope for practical work; The criterion of Difficulty –voice of the teacher ; Topical versus spinal; The principle of cyclic order ; Incidental versus organized teaching ; The Dalton plan ; The Project plan ; From the Empirical to the Rational ; The principle of correlation ; problems.Co-curricular activities in mathematics :Need and Importance – Math club ,Mathematics study circles,Mathematical hobbies,Math exhibition – Organizations,activities and its advantages –Mathematical Talent search –Objectives ,Abilities,skills to be tesyed and Method of selection.

UNIT III: LEARNING RESOURCES   (15 hours)

Causes for slow learning in mathematics and remedial measures for the backward-

Identification of the gifted and enrichment programmes for the gifted

UNIT -IV: CLASSROOM CLIMATE AND EXPLORING LEARNERS(15 hours)

Classroom climate-Autocratic, democratic, laissez faire.Flanders interaction analysis: Classroom interaction and evaluation of teacher behavior and its implications in learning mathematics.Modules –buzz session –quiz –debate – e learning – Learning with New Technologies –Online learning – power presentation –Digital lesson plan.

UNIT - V: EVALUATION OF TEACHING – LEARNING   (15 hours)

Different types of tests in Mathematics: Achievement, Diagnostic, Prognostic-Criterionand Norm referenced evaluation - Construction of Achievement Test - Continuous and Comprehensive Evaluation - Formative and Summative Evaluation-Statistical Measures:Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Quartile deviation,Rank Order Correlation Method and Karl Pearson's product moment method – Graphical representation of data: Bar diagram, Histogram, Pie Chart, Frequency curve, Frequency polygan and Ogive curve.

References
- Aggarwal, J.C. (2008).Teaching of Mathematics. UP: Vikas Publishing House.
- Bagyanathan, D.(2007).Teaching of Mathematics. Chennai: Tamil Nadu Text BookSociety.
- Bhasin, Sonia.(2005).Teaching of Mathematics- A practical approach-Mumbai:HimalayaPublishing House.
- Bhatia, K.K. (2001). Foundations of teaching learning process. Ludhiana: Tandon Publication.
- Ediger,M., & Rao. D.B., (2000).Teaching mathematics successfully.NewDelhi:DiscoveryPublishing House.
- Bawa, M.S &Nagpal, B.M., (2010).Developing Teaching Competencies.Viva BooksPrivate limited, New Delhi.
- James, Anice. (2009).Skills and strategies of teaching Mathematics. Hyderabad: Neelkamal Publication.
- Joyce.,&weil.,(2004).Models of teaching.U.K: Prentice Hall of India.
- Kapur, J.N. (2002).Suggested experiments in school Mathematics. New Delhi: AryaBook Depot.
- Kulshreshta,A.K. (2008).Teaching of Mathematics. Meerut: R.Lall Books Depot.

Mangal, S.K., &Mangal,S. (2005). Essentials of educational technology andmanagement. Meerut: Loyal Book Depot.

➢ NCERT.(2005). NCF for School Educaton. New Delhi: Anmol Publications.
Passi, B.K., (1991). Models of teaching.NCERT,New Delhi.

➢ Pratap,N. (2008). Teaching of Mathematics. Meerut: R.Lall Books Depot.

➢ Sharma, R.A. (2008).Technological foundations of education. Meerut: R.Lall BooksDepot.

➢ Sharan, R., & Sharma, M. (2006).Teaching of Mathematics. New Delhi: APH PublishingCorporation.

➢ Sidhu, K.S. (2006).Teaching of Mathematics. New Delhi: Sterling Publishers.

➢ Mathematics Books for standard VI - XII, Tamil Nadu Text Book Corporation, Government of Tamil Nadu.

PEDAGOGY OF MATHEMATICS

SEMESTER IV

OBJECTIVES:

At the end of the course, the student-teachers will be able to

UNIT - I: SYSTEM APPROACH AND ICT IN TEACHING AND LEARNING MATHEMATICS: (15 hours)

System Approach –Basic Concepts –Characteristics of a system – System approach fpr developing instructional systems –Micro and Macro systems ,Educational Cybernetics – Educational Technology and Systems approach.ICT – for teaching, learning, doing researches, evaluating.Web based instruction, online learning, Virtual classrooms.

UNIT - II: LEARNING FROM CYBER RESOURCES: (15 hours)

Identification and cataloguing of the three web sites related to the prescribed school curriculum.   A comparative evaluation of any two web pages bearing on the same unit in the school curriculum.

UNIT III: MODELS OF TEACHING MATHEMATICS (15 hours)

Models of teaching: concept and characteristics. Families of models; Information processing model, Personal model, Social interaction model and behavioral models. Concept attainment model, Advanced organizer model, and Inquiry model.

UNIT IV: PSYCHOLOGICAL THEORIES AND FACTORS INFLUENCING THE LEARNING OF MATHEMATICS (15 hours)

Psychological Theories: Gagne's types of learning, the ideas of Piaget and Bruner.

Psychological factors: Interest, attention, motivation, maturation, perception, special abilities, attitude, and aptitude, Divergent thinking and creative thinking in mathematics.

UNIT V: STATISTICS: (15 hours)

Correlation techniques: correlation-Meaning, types, coefficient of correlation – Product moment correlation and rank correlation.

Normal distribution: Properties of normal curve, skewness and kurtosis.

References
- Aggarwal, J.C. (2008).Teaching of Mathematics. UP: Vikas Publishing House.
- Bagyanathan, D.(2007).Teaching of Mathematics. Chennai: Tamil Nadu Text BookSociety.
- Bhasin, Sonia.(2005).Teaching of Mathematics- A practical approach- Mumbai:HimalayaPublishing House.
- Bhatia, K.K. (2001). Foundations of teaching learning process. Ludhiana: Tandon Publication.
- Ediger,M., & Rao. D.B., (2000).Teaching mathematics successfully.NewDelhi:DiscoveryPublishing House.
- Bawa, M.S &Nagpal, B.M., (2010).Developing Teaching Competencies.Viva BooksPrivate limited, New Delhi.
- James, Anice. (2009).Skills and strategies of teaching Mathematics. Hyderabad: Neelkamal Publication.
- Joyce.,&weil.,(2004).Models of teaching.U.K: Prentice Hall of India.
- Kapur, J.N. (2002).Suggested experiments in school Mathematics. New Delhi: AryaBook Depot.
- Kulshreshta,A.K. (2008).Teaching of Mathematics. Meerut: R.Lall Books Depot. Mangal, S.K., &Mangal,S. (2005). Essentials of educational technology andmanagement. Meerut: Loyal Book Depot.
- NCERT.(2005). NCF for School Educaton. New Delhi: Anmol Publications. Passi, B.K., (1991). Models of teaching.NCERT,New Delhi.

- Pratap,N. (2008). Teaching of Mathematics. Meerut: R.Lall Books Depot.
- Sharma, R.A. (2008).Technological foundations of education. Meerut: R.Lall BooksDepot.
- Sharan, R., & Sharma, M. (2006).Teaching of Mathematics. New Delhi: APH PublishingCorporation.
- Sidhu, K.S. (2006).Teaching of Mathematics. New Delhi: Sterling Publishers.
- Mathematics Books for standard VI - XII, Tamil Nadu Text Book Corporation, Government of Tamil Nadu.

SUGGESTED PRACTICALS

- Practice of skills in micro teaching.
- Preparation of lesson plans.
- Prepare various teaching aids.

SUGGESTED PRACTICALS

- Project on Riddles and puzzles in Mathematics.
- Critical analysis of teacher behavior.
- Preparation of beautiful number patterns.
- Comparison of the contributions of Indian and foreign Mathematicians.
- Critical analysis of content course of standard XI and XII Mathematics syllabus.

SUGGESTED PRACTICALS

- Project on Mathematics and its relationship with other discipline and its branches.
- Preparation of Improvised aids.
- Preparation of transparent sheets.
- Comparison of two web pages on Mathematics in school curriculum.
- Critical analysis of content course of standard IX and X Mathematics syllabus.

SUGGESTED PRACTICALS

- Practicing the models of teaching

- ➤ Participating in buzz sessions in class discussion.
- ➤ Collection of various shortcut techniques

SUGGESTED ACTIVITIES
1. Collect and present the History and Contributions of any one Mathematician.
2. Discussion on various learning resources in Mathematics.
3. Preparation of Teaching Learning Material for any one topic in Mathematics.
4. Preparation of Power Point Presentation for any one topic in Mathematics.
5. Identify and practice suitable methods of teaching to teach a Mathematical Concept.
6. Conduct a Mathematical Quiz.
7. Organise a Mathematics Club.