

**Himachal Pradesh University
Summer Hill, Shimla-171005**



Syllabus and Scheme of Examination

For

**Three Year B. A./ B.Sc./ with major in Mathematics
Four Year B. A./ B. Sc. (Hons./ Hons with research) with major/ and minor in
Mathematics**

under the

National Education Policy 2020

w.e.f.

Academic Session 2025 -26 onwards

HIMACHAL PRADESH UNIVERSITY
B.Sc. First Year Syllabus and Examination Scheme
First Semester

Course Code	SEC-MATH-113
Credits	3
Name of the Course	Elementary Algebra
Type of the Course	Skill Enhancement Course (SEC 1)
Number of hours required for this course	45 hrs.
Attendance-05 Marks Class Test-10 Marks Assignments & Presentations-10 Marks	Max. Marks: 25
Semester Term End Examination	Max Marks: 50 Maximum Time: 2 hrs.
Lectures to be Delivered (One Hour Each)	45

Instructions

- 1. Instructions for paper setter:** The question paper will consist of four parts A, B, C and D of 50 marks and the examiner shall set 7 questions in all. Two questions will be set from each section I, II, and III of the syllabus and each question will carry 12 marks. Section D will be compulsory and will have 10 short answer type questions from all the sections (I, II, III) of the syllabus each of two marks.
- 2. Instructions for Candidates:** Candidates are required to attempt four questions in all. Section D is Compulsory in which students should attempt 7 questions in total whereas they are required to attempt one question from each Section A, B and C in the question paper.

SEC-1: Elementary Algebra

Course Objectives: The main objectives of the course are

- To understand the basic concepts of polynomials, types of polynomials, Algebraic operations on polynomials and Euclidean algorithm for polynomials.
- To acquire the knowledge of Horner's method of synthetic division, polynomial equations and their roots, fundamental theorems of Algebra and its applications.
- To gain the knowledge of the relation between the roots and the coefficients of general polynomial equation of one variable and its applications, Transformation of equations.
- To acquire the knowledge of reduction of general form of cubic equation to standard form of cubic and its solution by Cardon's Method, reduction of general form to standard form of biquadratic and its solution by Descartes's and Ferrari's Methods, Descartes's rule of signs.

Course Learning Outcomes: After the completion of course, the students will be able to

- Describe the basic concepts of polynomials, types of polynomials, Algebraic operations on polynomials and Euclidean algorithm for polynomials.
- Explain the concept of Horner's method of synthetic division, polynomial equations and their roots, fundamental theorems of Algebra and its applications.
- Understand and find the relation between the roots and the coefficients of general polynomial equation of one variable and Transformation of equations.
- Reduce the general form of cubic equation to standard form of cubic by Cardon's Method, standard form of biquadratic by Descartes's and Ferrari's Methods.

Section-I (15 hrs.)

Polynomials in one variable: Polynomials, Multiplication and Division of Polynomials, The Remainder Theorem, Synthetic Division, Horner's process & Highest common divisor of two Polynomials.

Section-II (15 hrs.)

Algebraic equations, Identity theorem, The Fundamental Theorem of Algebra, Imaginary roots of equations with real coefficients, Relation between roots and coefficients & Discovery of multiple roots.

Section-III (15 hrs.)

Cardan's formulas, Discussion of solution, Irreducible case, Trigonometric solution, Criterion of the Nature of Roots of Cubic, Solution of Biquadratic equations (Descartes' and Ferrari method), Descartes' rule of sign.

Recommended Book:

1. J.V. Uspensky, Theory of equations, McGraw Hill (1948). Chapter- II: §§ 1 to 6, §§ 8, Chapter-III: §§1 to 6, Chapter-V: §§ 2 to 6 & Chapter-VI: §§10.
2. H. W. Turnbull, Theory of equations, OLIVER AND BOYD, Fourth Edition, 1947.

HIMACHAL PRADESH UNIVERSITY
B.Sc. (Non-Medical) Syllabus and Examination Scheme
Second Semester

Course Code	SEC-MATH-123
Credits	3
Name of the Course	Logic and Sets
Type of the Course	Skill Enhancement Course (SEC 2)
Number of hours required for this course	45 hrs.
Attendance-05 Marks Class Test-10 Marks Assignments & Presentations-10 Marks	Max. Marks:25
Semester Term End Examination	Max Marks: 50 Maximum Time: 2 hrs.
Lectures to be Delivered	45 hrs

Instructions

- 1. Instructions for paper setter:** The question paper will consist of four parts A, B, C and D of 50 marks and the examiner shall set 7 questions in all. Two questions will be set from each section I, II, and III of the syllabus and each question will carry 12 marks. Section D will be compulsory and will have 10 short answer type questions from all the sections (I, II, III) of the syllabus each of two marks.
- 2. Instructions for Candidates:** Candidates are required to attempt four questions in all. Section D is Compulsory in which students should attempt 7 questions in total whereas they are required to attempt one question from each Section A, B and C in the question paper.

SEC 2.1: Logic and Sets

Course Objectives: After thorough learning of the course, students will be able to

- Get a comprehensive understanding of the logic and sets.
- Recognize some basic notions that will be needed as background for most of the mathematics and computer science courses.
- Familiar with abstract mathematical thinking & reasoning, which helps to understand and apply mathematical concepts to analyze and interpret various types of data.

Course Learning Outcomes: By the end of the course, students will be able to

- Describe memberships of sets, including the empty set, using proper notation, and decide whether given items are members and determine the cardinality of a given set.
- Perform the operations of union, intersection, complement, and difference on sets using proper notation.
- Draw and interpret Venn diagrams of set relations and operations and use Venn diagrams to solve problems.
- Recognize when set theory is applicable to real-life situations, solve real-life problems, and communicate real-life problems and solutions to others.

Section I (15 hrs.)

Definition of logic, propositions, truth table, negation, conjunction and disjunction, conditional, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators.

Section II (15 hrs.)

Propositional equivalence: Logical equivalences, Predicates and quantifiers. Sets, subsets, Power set of a set, Set operations, Venn diagrams, Finite and infinite sets.

Section III (15 hrs.)

Counting principle, Classes of sets, Set identities, De- Morgan's Law, Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation.

Recommended Books:

1. R.P. Grimaldi, Discrete Mathematics and Combinatorial Mathematics, Pearson Education, 1998.
2. P. R. Halmos, Naive Set Theory, Springer, 1974.

