

Sir P. T. Sarvajanik College of Science, Surat
DEPARTMENT OF MATHEMATICS

B Sc (Mathematics) Programme

Programme Outcomes:

The Mathematics program promotes mathematical skills and knowledge for their intrinsic beauty, effectiveness in developing proficiency in analytical reasoning, and utility in modeling and solving real world problems. To responsibly live within and participate in the transformation of a rapidly changing, complex, and interdependent society, students must develop and unceasingly exercise their analytical abilities. Students who have learned to logically question assertions, recognize patterns, and distinguish the essential and irrelevant aspects of problems can think deeply and precisely, nurture the products of their imagination to fruition in reality, and share their ideas and insights while seeking and benefiting from the knowledge and insights of others.

After completing B.Sc (Mathematics) Programme students will be able to:

- PO1 :** Explain the importance of mathematics and investigate the real world problems and learn to how to apply mathematical ideas and models to those problems.
- PO2 :** Reason mathematically and apply rigorous, analytic, highly numerate approach to analyze, execute tasks and solve problems in daily life and at work.
- PO3 :** Recognize the power of abstraction and generalization, and to carry out investigative mathematical work with independent judgment.
- PO4 :** Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods
- PO5 :** Identify the type and solve abstract mathematical problems and give geometrical interpretation of various concepts.
- PO6 :** Recognize connections between different subjects in mathematics.
- PO7 :** Develop an understanding of the underlying unifying structures of mathematics (sets, relations and functions, logical structure) and the relationships among them.
- PO8 :** Conduct self-evaluation, and continuously enrich them through lifelong learning.
- PO9 :** Communicate and interact effectively with different audiences and collaborate intellectually and creatively in diverse contexts, while emphasizing the importance of clarity and precision in communication and reasoning.
- PO10 :** Formulate and analyze mathematical problems, precisely define the key terms, and draw clear and reasonable conclusions.

Programme Specific Outcomes (only 3)

- PSO1:** Help the students to enhance their knowledge in soft skills and Computing skills.
- PSO2:** Enable the students to equip knowledge in various concepts involved in functions of single variable.
- PSO3:** Enable the students to equip knowledge in various concepts involved in Calculus and geometry.

Course Outcomes

F.Y. B Sc (Mathematics)

Course MTH-101: Mathematics-I (SEM - I)

After successfully completing this course, students will be able to:

- CO1:** Understand De' Moirve's theorem and its applications.
- CO2:** Understand Euler's Expression, Understand Hyperbolic functions for real arguments.
- CO3:** Understand the exponential, Circular and Hyperbolic functions for complex arguments.
- CO4:** Understand the Logarithm of complex numbers, inverse hyperbolic functions and separation of these into real and imaginary parts.

Course MTH-102: Mathematics-II (SEM - I)

After successfully completing this course, students will be able to:

- CO1:** Understand Successive differentiation, nth derivatives, Understand the use and application of Leibnitz theorem,
- CO2:** Understand Rolle's theorems and their geometrical interpretation, understand the use of Cauchy's theorem, and understand the use of Maclaurin and Taylor's Expansions.
- CO3:** Understand the curvatures, asymptotes, concavity and convexity, understand the decreasing and increasing functions.
- CO4:** Able to derive the reduction formula of integration of various functions.

Course MTH-201: Mathematics-III (SEM - II)

After successfully completing this course, students will be able to:

- CO1:** Understand matrices and types of matrices, operations on matrices.
- CO2:** Understand elementary row operations, row-echelon form, row rank, inverse of matrix by elementary row operations.
- CO3:** Understand diagonalization, trace of matrix, solving the system of homogeneous and non-homogeneous linear equation by row-reduced echelon form.
- CO4:** Understand characteristic equation of a matrix, eigen values and vectors, Cayley-Hamilton theorem, inverse of a matrix using Cayley-Hamilton theorem.

Course MTH-202: Mathematics-IV (SEM - II)

After successfully completing this course, students will be able to:

- CO1:** Understand the curve tracing and parametric equations.
- CO2:** Understand application of integral calculus, length of a curve, intrinsic equations.
- CO3:** Understand linear differential equations of first order, exact equations, Bernoulli's equations, Lagrange's equation, Clairaut's equation.
- CO4:** Understand linear differential equations with constant coefficients.

S. Y. B Sc (Mathematics)

Course MTH-301: Mathematics-V (Sem - III)

After successfully completing this course, students will be able to:

- CO1:** find the differentiation, understand the difference between partial and total differentiation.
- CO2:** Recognize composite function, homogeneous functions, Euler's theorem for homogeneous function.
- CO3:** solve examples using Taylor's theorem, Maclaurian's expansion and find Jacobian.
- CO4:** find the maxima & minima of functions of two variables.
- CO5:** familiar with the necessary and sufficient conditions for extreme points.
- CO6:** find the derivatives of vector point function.
- CO7:** find the gradients, curl, and divergence.
- CO8:** Understand integral and find the line integral.

Course MTH-302: Mathematics-VI (Sem - III)

After successfully completing this course, students will be able to:

- CO1:** familiar with the concept of 'error'.
- CO2:** find the error in various calculations.
- CO3:** apply Bisection, Iteration, Regula-falsi and Newton-Raphson's methods to find the real roots of transcendental equations.
- CO4:** understand the concept of finite differences.
- CO5:** learn how to construct forward, backward and central difference table.
- CO6:** familiar with numerical interpolation and approximation of functions

Course MTH-303: Mathematics-VII (Sem - III)

After successfully completing this course, students will be able to:

- CO1:** Identify various types of ordinary differential equations and find their general solution.
- CO2:** understand applications of differential equations.
- CO3:** solve linear differential equations.
- CO4:** apply various methods to solve ordinary differential equations.
- CO5:** form partial differential equations.
- CO6:** solve partial differential equations by applying some special methods.

Course EG: Mathematical Methods (Sem - III)

After successfully completing this course, students will be able to:

- CO1:** familiar with finite difference operators.
- CO2:** familiar with relations between different operators.
- CO3:** use finite difference table to find missing term in the given table of data.
- CO4:** understand the factorial notation.
- CO5:** use of finite differences to express the polynomial in factorial notations
- CO6:** understand and solve the homogeneous difference equations.

Course MTH-401: Mathematics-VIII (Sem - IV)

After successfully completing this course, students will be able to:

- CO1:** know Beta-Gamma functions, relate Beta and Gamma functions.
- CO2:** understand the application of Beta-Gamma functions.
- CO3:** find double and triple integral.
- CO4:** change the order of double integral and find the area using integration.
- CO5:** know Laplace transform, understand Laplace transform of some elementary functions
- CO6:** know inverse Laplace transform and properties of inverse Laplace transform.

Course MTH-402: Mathematics-IX (Sem - IV)

After successfully completing this course, students will be able to:

- CO1:** familiar with finite difference with unequal interval.
- CO2:** apply Lagrange's, Divided differences and Newton's general interpolation formula.
- CO3:** understand the numerical differentiation.
- CO4:** apply Newton's forward and backward difference interpolation formulae to find first and second order derivatives.
- CO5:** understand the numerical integration.
- CO6:** apply Trapezoidal and Simpson's rule to evaluate integration.
- CO7:** use Taylor's series method, Picard's method and Euler's method to solve the ordinary differential equations.

Course MTH-403: Mathematics-X (Sem - IV)

After successfully completing this course, students will be able to:

- CO1:** have a knowledge of important mathematical concepts sets, elements, functions.
- CO2:** understand the concept of countable and uncountable sets.
- CO3:** find the Greatest lower bound and least upper bound
- CO4:** understand the concepts of sequences and limit of the sequence.
- CO5:** understand the concept of convergent sequence and divergent sequence, bounded sequence, monotone sequence, Cauchy sequence.
- CO6:** understand the concept of divisibility.
- CO7:** find gcd, lcd and understand the relation between gcd and lcm.
- CO8:** classify prime and composite numbers.
- CO9:** understand the theory of congruence and properties of congruence.
- CO10:** understand equivalence classes.

Course EG: Mathematical Modelling (Sem - IV)

After successfully completing this course, students will be able to:

- CO1:** understand the mathematical modelling.
- CO2:** construct the model such as linear growth models, linear decay models, models for growth of science and scientist.
- CO3:** construct the mathematical models of geometrical problems and orthogonal trajectories.

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Course MTH-501: Group Theory (SEM -V)

After successfully completing this course, students will be able to:

- CO1:** understand the concept of cosets, congruence relation in group.
- CO2:** understand Lagrange's theorem, Euler's theorem, Fermat's theorem.
- CO3:** understand subgroup, homomorphism, isomorphism, isometric groups,
- CO4:** understand automorphism and Cayley's theorem.
- CO5:** understand permutation groups, orbit, cycles, alternating group.

Course MTH-502: Linear Algebra-I (SEM -V)

After successfully completing this course, students will be able to:

- CO1:** understand the concepts of base and dimension of vector space.
- CO2:** understand the concept subspace of a vector space.
- CO3:** understand span of a set, operations on subspaces.
- CO4:** identify linearly independent and linearly dependent vectors.
- CO5:** extend linearly independent set to a basis.

Course MTH-503: Real Analysis – I (SEM-V)

After successfully completing this course, students will be able to:

- CO1:** understand the concepts of countable set, uncountable set, lub, glb of a sequence.
- CO2:** understand the concepts of sequences and limit of the sequence.
- CO3:** understand the concept of convergent sequence and divergent sequence, bounded sequence, monotone sequence, Cauchy sequence
- CO4:** understand the operations on sequences.
- CO5:** understand the concept of limit superior and inferior.

Course MTH-504: Real Analysis – II (SEM-V)

After successfully completing this course, students will be able to:

- CO1:** understand the concept of limit and continuity of a function on the real line.
- CO2:** understand the concept of metric space.
- CO3:** explain convergence and divergence of sequence in metric space.
- CO4:** understand the Cauchy's sequence in metric space and equivalent metrics.
- CO5:** understand the concept of an open ball in \mathbb{R}^1 and metric space.
- CO6:** understand the continuity of a function in a metric space.
- CO7:** understand the concept of open sets.

Course MTH-505: Graph Theory (SEM-V)

After successfully completing this course, students will be able to:

- CO1:** understand about Graph
- CO2:** identify the properties of different types of graph and their application
- CO3:** understand the concept of subgraphs and isomorphism.

- CO4:** understand the operations on the graphs.
- CO5:** classify the graph such as walks, paths, circuits.
- CO6:** draw all types of graphs.
- CO7:** understand the concept of Euler's graph and its application.
- CO8:** classify Hamiltonian graphs, circuits and paths.
- CO9:** explain Konigsberg bridge problem, seating problem, utility problem, arrangement problem.
- CO10:** understand the concept of trees.
- CO11:** know about properties of trees, know about distance between two vertices, centre, radius and diameter of a tree.
- CO12:** identify rooted and binary trees.

Course MTH-506: Number Theory-I (SEM-V)

After successfully completing this course, students will be able to:

- CO1:** understand the concept of divisibility of integers.
- CO2:** use terminology in number theory.
- CO3:** understand the division algorithm.
- CO4:** understand gcd of two integers.
- CO5:** understand the Euclidean algorithm.
- CO6:** find the remainder and quotient by division algorithm.
- CO7:** understand the relation between gcd and lcm.
- CO8:** find the solution of Diophantine equations in two variables.
- CO9:** classify prime and composite numbers.
- CO10:** understand the concept of sieve of Eratosthenes.
- CO11:** understand the theory of congruence.
- CO12:** understand the properties of congruence.

Course EG-5001: Operations Research-I (SEM-V)

After successfully completing this course, students will be able to:

- CO1:** understand the basics of operations research.
- CO2:** Recognize all the definitions and concepts by giving examples of operations research.
- CO3:** formulate the problem as linear programming problem.
- CO4:** understand the primal and dual of lpp.
- CO5:** plot the graph of lpp.
- CO6:** solve the lpp by graphical method.
- CO7:** understand the concept of solutions of lpp.
- CO8:** solve the lpp by simplex method.
- CO9:** solve the lpp by two-phase method.
- CO10:** solve the lpp by Big-M method.
- CO11:** Choose appropriate method for solving lpp.

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Course MTH-601: Ring Theory (SEM -VI)

After successfully completing this course, students will be able to:

- CO1:** understand the concept of ring homomorphism and isomorphism.
- CO2:** understand ideal and quotient rings.
- CO3:** understand maximal ideal and principal ideal,
- CO4:** understand Euclidean ring.
- CO5:** understand divisibility in commutative ring.
- CO6:** understand gcd of two elements in ring.
- CO7:** understand units and associates in rings.
- CO8:** understand prime element in a Euclidean ring.
- CO9:** use unique factorization theorem in a Euclidean ring.
- CO10:** understand polynomial ring.
- CO11:** understand degree of a polynomial.
- CO12:** understand division algorithm and irreducible polynomial.

Course MTH-602: Linear Algebra-II (SEM -VI)

After successfully completing this course, students will be able to:

- CO1:** recall the definition of vector space.
- CO2:** understand the concept linear transformations.
- CO3:** understand range and kernel of linear transformation.
- CO4:** understand rank-nullity theorem.
- CO5:** apply the rank-nullity theorem.
- CO6:** form a matrix associated with linear transformation.
- CO7:** understand the inner product and norm of a vector.
- CO6:** understand Gram-Schmidt orthogonalized process.

Course MTH-603: Real Analysis – III (SEM-VI)

After successfully completing this course, students will be able to:

- CO1:** understand the concepts of convergence and divergence of series of real numbers.
- CO2:** understand the concepts of alternating, conditional and absolute convergence.
- CO3:** test for absolute convergence.
- CO4:** understand the definition of Riemann integral.
- CO5:** state the algebraic properties of Riemann integral.
- CO6:** know the mean value theorem of integral calculus.

Course MTH-604: Real Analysis – IV (SEM-V)

After successfully completing this course, students will be able to:

- CO1:** know the limit points, closure of a set, closed sets.
- CO2:** understand the concept homomorphism of metric space.
- CO3:** understand the dense set.
- CO4:** know the connected sets, bounded sets, totally bounded sets.
- CO5:** understand the concept of complete metric spaces.

- CO6: understand the contraction mapping.
- CO7: understand the Picard's fixed point theorem.
- CO8: understand the concept of compact metric space.
- CO9: understand the concept of open covering.
- CO10: understand the Heine-Borel property.
- CO11: understand the finite intersection property.

Course MTH-605: Discrete Mathematics (SEM-V)

After successfully completing this course, students will be able to:

- CO1: apply the Set theory and Relation concepts.
- CO2: find glb and lub of sets.
- CO3: draw Hasse diagram.
- CO4: understand the lattice and its properties.
- CO5: classify the different types of lattice.
- CO6: understand the concept of Boolean algebra.
- CO7: represent Boolean function as sum of product canonical form.
- CO8: represent Boolean function as product of sum canonical form.
- CO9: minimize the Boolean function using Boolean algebra.
- CO10: design the circuits using logical gates.
- CO11: reduce the switching circuit diagram.

Course MTH-606: Number Theory-II (SEM-V)

After successfully completing this course, students will be able to:

- CO1: solve the linear congruence.
- CO2: apply Chinese-Remainder theorem to find the solution of simultaneous linear congruences.
- CO3: apply Fermat's little theorem to compute powers of integers modulo prime numbers.
- CO4: understand the concept of pseudo-primes.
- CO5: apply the Wilson's theorem.
- CO6: understand the concept of the Mobius inversion formula.
- CO7: understand the Euler's Phi-function.
- CO8: understand the Euler's theorem.

Course EG-6001: Operations Research-II (SEM-V)

After successfully completing this course, students will be able to:

- CO1: identify the balanced and unbalanced transportation problem.
- CO2: find the solution of transportation problem.
- CO3: identify the balanced and unbalanced assignment problem.
- CO4: find the solution of an assignment problem.
- CO5: understand the terminology of Games.
- CO7: identify the game without saddle point and with saddle point.
- CO8: solve the game with mixed strategies.
- CO9: use graphical method to solve $m \times 2$ or $2 \times n$ games.

DEPARTMENT OF MATHEMATICS
B. Sc. (STATISTICS)

F. Y. B. Sc.

Course: Paper 101 (Descriptive Statistics)

Collection of Data:

After successfully completing this course, students will be able to:

- CO1:** distinguish between different types of data and learn level of measurement of data;
- CO2:** understand the meaning and purpose of data collection;
- CO3:** know different methods of collection of data;
- CO4:** distinguish between primary and secondary sources.

Classification and tabulation of data:

After successfully completing this course, students will be able to:

- CO1:** classify the data for further statistical analysis;
- CO2:** find the difference between quantitative and qualitative classification;
- CO3:** prepare a frequency distribution table;
- CO4:** know the technique of forming classes;
- CO5:** differentiate between univariate and bivariate frequency distributions;
- CO6:** present data using table.

Diagrammatic and graphic presentation of data:

After successfully completing this course, students will be able to:

- CO1:** learn importance of diagrammatic presentation of data;
- CO2:** distinguish between diagram and graph;
- CO3:** learn how to visualize your data;
- CO4:** create bar diagram, pie chart, stem and leaf chart, box plot chart etc;
- CO5:** construct and interpret a graph like histogram, frequency polygon and frequency curve for numerical data.

Course: (Paper 102) Different Measures of Statistics

Measures of central tendency:

After successfully completing this course, students will be able to:

- CO1:** state the need for summarizing a set of data by a single number;
- CO2:** distinguish between different types of averages;
- CO3:** learn to compute different averages;
- CO4:** draw meaningful conclusions from a set of data.

Measures of dispersion:

After successfully completing this course, students will be able to:

- CO1:** know the limitations of average;
- CO2:** encourage the need of measures of dispersion;
- CO3:** understand various types of measures of dispersion;
- CO4:** obtain the measures and then compare them;
- CO5:** differentiate between absolute and relative measures.

Moments:

After successfully completing this course, students will be able to:

- CO1:** know the purpose of moments;
- CO2:** obtain various types of moments;

CO3: understand different characteristics of data.

Practical:

After successfully completing this course, students will be able to:

- CO1:** prepare frequency distribution for univariate and bivariate variable;
- CO2:** construct table from given data;
- CO3:** represent statistical data diagrammatically;
- CO4:** analyze statistical data graphically, using frequency distributions and cumulative frequency distributions;
- CO5:** obtain and interpret different measures of central tendency;
- CO6:** compute and interpret different measures of dispersion;
- CO7:** obtain different types of moments and interpretation of it.

Course: (Paper 201) Skewness, Kurtosis, Probability Skewness and Kurtosis:

After successfully completing this course, students will be able to:

- CO1:** know the complementary relationship of skewness with measures of central tendency and dispersion in describing a set of data;
- CO2:** know whether the distribution is normal or not;
- CO3:** tell the direction and extent of asymmetry in a data series;
- CO4:** learn the importance of kurtosis;
- CO5:** evaluate and interpret types of kurtosis;
- CO6:** distinguish difference between skewness and kurtosis.

Probability - I:

After successfully completing this course, students will be able to:

- CO1:** be familiar with some basic concepts of probability;
- CO2:** distinguish between random and non-random experiments;
- CO3:** understand axioms of probability and various theorems on probability;
- CO4:** find the probabilities of various events.

Probability - II:

After successfully completing this course, students will be able to:

- CO1:** understand the concepts of conditional probability and independence of events;
- CO2:** know about Bayes' theorem and its applications;
- CO3:** find probabilities of various events.

Course: (Paper 202) Univariate and Bivariate Probability functions and Moments

Random Variables, Probability functions and Mathematical expectation:

After successfully completing this course, students will be able to:

- CO1:** know the basic concept of random variables;
- CO2:** understand events associated with random variables, probabilities of events and how they are related;
- CO3:** understand the difference between a discrete and a continuous random variable, recognize when an experiment should be modelled by a discrete or a continuous random variable;
- CO4:** know about p.m.f., p.d.f. and c.d.f.;
- CO5:** obtain probability functions;
- CO6:** interpret the expectation, variance and standard deviation of a discrete and continuous random variable.

Bivariate Random Variables:

After successfully completing this course, students will be able to:

- CO1:** distinguish between univariate and bivariate random variables;
- CO2:** understand joint, marginal and conditional p.m.f. and p.d.f. of two random variables;

CO3: compute of probabilities of events in bivariate probability distribution.

Moments, Measure of central tendency and dispersion for discrete and continuous random variables:

After successfully completing this course, students will be able to:

CO1: understand measure of central tendency related to random variables;

CO2: understand measure of dispersion related to random variables;

CO3: obtain different moments of a probability distribution.

Practical:

After successfully completing this course, students will be able to:

CO1: find skewness using an appropriate method for a given frequency distribution and interpret the result;

CO2: obtain kurtosis for a given frequency distribution and interpret result;

CO3: solve examples of probability;

CO4: construct bivariate frequency distribution;

CO5: calculate probabilities and derive marginal and conditional distributions of bivariate random variables.

S. Y. B. Sc.

Course: (Paper 301) Correlation, Regression and Association of Attributes

Linear Correlation Analysis:

After successfully completing this course, students will be able to:

CO1: comprehend the meaning of the term 'correlation';

CO2: interpret the nature of relationship between two variables;

CO3: compute correlation coefficient and interpret its value;

CO4: critically examine the degree and direction of the relationships between two or more variables;

CO5: understand applications of correlation theory in various fields, viz., agriculture, business, medical science, industry etc.

Linear Regression Analysis:

After successfully completing this course, students will be able to:

CO1: describe the difference between 'correlation' and 'regression';

CO2: understand the purpose of a linear regression equation;

CO3: calculate and interpret linear regression equation;

CO4: understand and interpret coefficient of determination;

CO5: understand applications of regression analysis in various fields, viz., agriculture, business, industry etc.

Measures of association of attributes (for two attributes):

After successfully completing this course, students will be able to:

CO1: learn about importance of measures of association;

CO2: understand different types of measures of association;

CO3: learn the concepts of independence and association of two attributes;

CO4: calculate measures of association using different methods.

Course: (Paper 302) Numerical Analysis

Finite Differences Interpolation Numerical Integration and Differentiation

After successfully completing this course, students will be able to:

- CO1:** understand basics of numerical analysis;
- CO2:** understand the difference operators and the use of interpolation;
- CO3:** understand numerical differentiation and integration;
- CO4:** develop problem solving skills through numerical methods.

Course: (Paper 303) Sampling techniques

Terminology and Simple random sampling Stratified random sampling Systematic random sampling

After successfully completing this course, students will be able to:

- CO1:** know about the concept of sampling;
- CO2:** understand about sample survey;
- CO3:** distinguish between a population and a sample and between parameters and statistics;
- CO4:** recognize some common types of sampling design, such as simple random sampling, stratified sampling and systematic sampling.

Practical:

After successfully completing this course, students will be able to:

- CO1:** find and interpret the correlation between two variables;
- CO2:** obtain simple linear regression equation for a set of data;
- CO3:** employ the principles of linear regression and correlation, including least square method, predicting a particular value of Y for a given value of X and understand the significance of the correlation coefficient;
- CO4:** know the association between two attributes;
- CO5:** learn how to select as SRS with and without replacement;
- CO6:** obtain estimated mean and standard error for various sampling techniques.

Course: (Paper 401) Generating function and discrete probability distribution

Generating functions, Bernoulli distribution and Binomial distribution Poisson distribution and discrete uniform distribution Hypergeometric, Geometric and Negative binomial distribution

After successfully completing this course, students will be able to:

- CO1:** obtain moment generating function, cumulative generating function etc. of a probability function;
- CO2:** define discrete variables and study their distributions;
- CO3:** know the applications of discrete probability distribution in different situations;
- CO4:** understand some standard discrete probability distributions such as Binomial, Poisson, Geometric, Hyper geometric, Negative binomial, Uniform with real life situations.

Course: (Paper 402) Continuous probability distribution

Normal distribution, Rectangular distribution and Exponential distribution Gamma distribution, Beta distribution of first kind and second kind

After successfully completing this course, students will be able to:

- CO1:** understand various continuous probability distributions theoretically;
- CO2:** know the applications of normal distribution in different fields;
- CO3:** relate gamma and beta distribution;
- CO4:** obtain properties of exponential distribution.

Course: (Paper 403) Testing of hypothesis

Terminology

Test of significance - I (Large sample test)

Test of significance - II (Small sample test)

After successfully completing this course, students will be able to:

- CO1:** understand the concept of hypothesis and its testing and applications in various fields;
- CO2:** identify the components of a classical hypothesis test, including the parameter of interest, the null and alternative hypotheses, type I error and type II error, Critical region, the test statistic etc;
- CO3:** understand the difference between large and small sample and tests based on it;
- CO4:** use the p-value decision rule to make a statistical decision;
- CO5:** carry out appropriate statistical test of significance;
- CO6:** obtain different large and small sample tests;
- CO7:** relate, F and chi-square variates.

Practical:

After successfully completing this course, students will be able to:

- CO1:** know the application problems based on Normal distribution;
- CO2:** compute probabilities of normal distribution;
- CO3:** learn testing of hypothesis based on small sample tests;
- CO4:** fit various probability distributions;
- CO5:** learn testing of hypothesis based on large sample tests.