List of relevant Mathematical Courses

State here all the math related courses you followed during your studies/school years.

Course Name (As stated in the transcript)	Brief description of course content	Credits earned/ working hours	Grade
Statistics & Probability Theory			
Mathemtaics-highschool(X)	Mean, Median and mode of grouped data Simple problems on finding the probability of event		83 out of 100
Mathematics-Class X1,XII	Measures of Dispersion: Range Mean deviation, variance and Std Deviation Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomati probability, Probability of an event, probability of 'not', 'and' and 'or' events. Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean of random variable.		83 out of 100
Linear Algebra			
Mathematics-highschool(X)	Polynomials, Pair of Linear equations, Quadratic Equations, Arithmatic progressions		83 out of 100
Mathematics-Class X1,XII	Complex Numbers and Quadratic Equations, Linear Inequalities, Binomial Theorem Sequence and Series, Permutations and Combinationsl, Metrices, Determinants		83 out of 100
Differential Equations			
Mathematics-Class X1,XII	Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree.		83 out of 100
Engineering Mathematics-II (B.Tech, 2nd Sem)	First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's Oridinary differential equations of higher orders: Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.		84 out of 150
Other			

NOTE: I have added below the syllabus of all the mathematics courses that I took during my academics (Highschool-X , Senior Secondary School/Intermediate-XI,XII , Undergraduation-1st Year).

Definition of a Credit Point	
Total number of credits	

UNIT V: MENSURATION
1. AREAS
   Area of a triangle using Heron's formula (without proof)
2. SURFACE AREAS AND VOLUMES
   Surface areas and volumes of spheres (including hemispheres) and right circular cones.

UNIT VI: STATISTICS
STATISTICS
Bar graphs, histograms (with varying base lengths), and frequency polygons.

INTERNAL ASSESSMENT   **Max. Marks: 20**
(i)   Activities (02)- 2X5   **10 Marks**
(ii) Project Work (01)   **05 Marks**
(iii) Continuous Assessment (Unit Test)   **05 Marks**
   (There will be total 4 Unit Tests to be conducted throughout the year (two Unit Tests before half yearly examination and two after half yearly examination). At the time of half yearly result preparation best of two Unit Tests (I & II) marks will be taken and converted to the weightage of 05 marks. Likewise best of two Unit Tests (III & IV) marks will be taken and converted to the weightage of 05 marks for the annual result preparation.)

Class – X
TOTAL MARKS- 100 {80 (Theory) + 20 (Internal Assessment)}

THEORY: 80 Marks   **Time: 3:00 Hrs.**

Units	Unit Name	Marks
I	NUMBER SYSTEMS	06
II	ALGEBRA	20
III	COORDINATE GEOMETRY	06
IV	GEOMETRY	15
V	TRIGONOMETRY	12
VI	MENSURATION	10
VII	STATISTICS & PROBABILTY	11
	Total	**80**

UNIT I: NUMBER SYSTEMS
REAL NUMBER
   Fundamental Theorem of Arithmetic- statements after reviewing work done earlier and after illustrating and motivating through examples, Proofs of irrationality of $\sqrt{2}, \sqrt{3} \sqrt{5}$

UNIT II: ALGEBRA
1. POLYNOMIALS
   Zeros of a polynomial. Relationship between zeros and coefficients of quadratic polynomials.
2. PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
   Pair of linear equations in two variables and graphical method of their solution, consistency/inconsistency.
   Algebraic conditions for number of solutions. Solution of a pair of linear equations in two variables algebraically- by substitution, by elimination. Simple situational problems.

3. QUADRATIC EQUATIONS

Standard form of a quadratic equation $ax^2 + bx + c = 0, (a \neq 0)$. Solutions of quadratic equations (only real roots) by factorization, and by using quadratic formula. Relationship between discriminant and nature of roots.

Situational problems based on quadratic equations related to day to day activities to be incorporated.

4. ARITHMETIC PROGRESSIONS

Motivation for studying Arithmetic Progression Derivation of the nth term and sum of the first n terms of A.P. and their application in solving daily life problems.

UNIT III: COORDINATE GEOMETRY

Coordinate Geometry

Review: Concepts of coordinate geometry, graphs of linear equations. Distance formula. Section formula (internal division).

UNIT IV: GEOMETRY

1. TRIANGLES

Definitions, examples, counter examples of similar triangles.

a. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

b. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.

c. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.

d. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.

e. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.

2. CIRCLES

Tangent to a circle at, point of contact

a. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.

b. (Prove) The lengths of tangents drawn from an external point to a circle are equal.

UNIT V: TRIGONOMETRY

1. INTRODUCTION TO TRIGONOMETRY

Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios whichever are defined at $0º$ and $90º$. Values of the trigonometric ratios of 30^0, 45^0 and 60^0. Relationships between the ratios.

2. TRIGONOMETRIC IDENTITIES

Proof and applications of the identity $sin^2A + cos^2A = 1$. Only simple identities to be given.

3. HEIGHTS AND DISTANCES: Angle of elevation, Angle of Depression.

Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation / depression should be only 30°, 45°, and 60°.

UNIT VI: MENSURATION

1. AREAS RELATED TO CIRCLES

Area of sectors and segments of a circle. Problems based on areas and perimeter/circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60°, 90° and 120° only.

2. SURFACE AREAS AND VOLUMES

Surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones.

UNIT VII: STATISTICS AND PROBABILITY

1. STATISTICS

Mean, median and mode of grouped data (bimodal situation to be avoided).

2. PROBABILITY

Classical definition of probability. Simple problems on finding the probability of an event.

INTERNAL ASSESSMENT   **Max. Marks: 20**

(i)   Activities (02)- 2X5   **10 Marks**

(ii) Project Work (01)   **05 Marks**

(iii) Continuous Assessment (Unit Test)   **05 Marks**

(There will be total 3 Unit Tests (two Unit Tests before half yearly examination and one after half yearly examination) and a pre-board examination to be conducted throughout the year. At the time of half yearly result preparation best of two Unit Tests (I & II) marks will be taken and converted to the weightage of 05 marks. In annual board examination, marks of the best out of 3 Unit Tests will be taken and converted to the weightage of 05 marks for the result preparation.)

PRESCRIBED BOOKS:

1. गणित (Mathematics) - Textbook for class IX - NCERT Publication

2. गणित (Mathematics) - Textbook for class X - NCERT Publication

3. Laboratory Manual - Mathematics, secondary stage - NCERT Publication

4. Mathematics exemplar problems for class IX, NCERT publication.

5. Mathematics exemplar problems for class X, NCERT publication.

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One Paper

Three Hours   **Max Marks: 80**

No.	Units	Marks
I.	Sets and Functions	23
II.	Algebra	25
III.	Coordinate Geometry	12
IV.	Calculus	08
V.	Statistics and Probability	12
	Total	**80**
	Internal Assessment	**20**

Unit-I: Sets and Functions

1. **Sets**

Sets and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of a set of real numbers especially intervals (with notations). Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement.

2. **Relations & Functions**

Ordered pairs. Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Cartesian product of the set of reals with itself (upto R x R x R).Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer functions, with their graphs. Sum, difference, product and quotients of functions.

3. **Trigonometric Functions**

Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of

the identity sin2x + cos2x = 1, for all x. Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing *sin (x±y)* and *cos (x±y)* in terms of sin*x*, sin*y*, cos*x* & cos*y* and their simple applications. Deducing identities like the following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y} , \cot(x \pm y) = \frac{\cot x \cot y + 1}{\cot y \pm \cot x}$$

$$\sin\alpha \pm \sin\beta = 2\sin\frac{1}{2}(\alpha \pm \beta)\cos\frac{1}{2}(\alpha \mp \beta)$$

$$\cos\alpha + \cos\beta = 2\cos\frac{1}{2}(\alpha + \beta)\cos\frac{1}{2}(\alpha - \beta)$$

$$\cos\alpha - \cos\beta = -2\sin\frac{1}{2}(\alpha + \beta)\sin\frac{1}{2}(\alpha - \beta)$$

Identities related to sin2*x*, cos2*x*, tan2 *x*, sin3*x*, cos3*x* and tan3*x*.

Unit-II: Algebra

1. **Complex Numbers and Quadratic Equations**

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve some of the quadratic equations. Algebraic properties of complex numbers. Argand plane

2. **Linear Inequalities**

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line.

3. **Permutations and Combinations**

Fundamental principle of counting. Factorial *n.* (n!) Permutations and combinations, derivation of Formulae for $^{n}P_r$ and $^{n}C_r$ and their connections, simple applications.

4. **Binomial Theorem**

Historical perspective, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, simple applications.

5. **Sequence and Series**

Sequence and Series. Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P., sum of *n* terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M.

Unit-III: Coordinate Geometry

1.   Straight Lines

Brief recall of two dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axis, point -slope form, slope-intercept form, two-point form, intercept form, Distance of a point from a line.

2.   Conic Sections

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

3.   Introduction to Three-dimensional Geometry

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points.

Unit-IV: Calculus

1.   Limits and Derivatives

Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. Definition of derivative relate it to scope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

Unit-V Statistics and Probability

1.   Statistics

Measures of Dispersion: Range, Mean deviation, variance and standard deviation of ungrouped/grouped data.

2.   Probability

Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories of earlier classes. Probability of an event, probability of 'not', 'and' and 'or' events.

Internal Assessment

Class XI   **Marks:20**

S. No.	Topic	Marks
1	Activities Performed Throughout the Year (10 Activities)	05
2	Record of Activities	05
3	Activity performed during year-end test	03
4	Viva based on activities	02
5	Continuous Assessment	05
	Total	**20**

2024-25
MATHEMATICS (128)
CLASS-XII

One Paper

No.	Units	Marks
I.	Relations and Functions	08
II.	Algebra	10
III.	Calculus	35
IV.	Vectors and Three - Dimensional Geometry	14
V.	Linear Programming	05
VI.	Probability	08
	Total	80
	Internal Assessment	20

Unit-I: Relations and Functions

1.   Relations and Functions

Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

2.   Inverse Trigonometric Functions

Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

Unit-II: Algebra

1.   Matrices

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

2. **Determinants** Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit-III: Calculus

1. **Continuity and Differentiability**

Continuity and differentiability, chain rule, derivative of inverse trigonometric functions, $\sin^{-1}$, $\cos^{-1}$ and $\tan^{-1}$, derivative of implicit functions. Concept of exponential and logarithmic functions.
Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

2. **Applications of Derivatives**

Applications of derivatives: rate of change of quantities, increasing/decreasing functions, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

3. **Integrals**

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx^2 + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}$$

$$\int \frac{(px + q)}{ax^2 + bx + c}\,dx, \int \frac{(px + q)}{\sqrt{ax^2 + bx + c}}\,dx, \int \sqrt{a^2 \pm x^2}\,dx \text{ and } \int \sqrt{x^2 - a^2}\,dx$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. **Applications of the Integrals**

Applications in finding the area under simple curves, especially lines, circles/ parabolas/ellipses (in standard form only)

5. **Differential Equations**

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + py = q, \text{ where p and q are functions of } x.$$

Unit-IV: Vectors and Three-Dimensional Geometry

1.   Vectors

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

2.   Three - dimensional Geometry

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, skew lines, shortest distance between two lines. Angle between two lines.

Unit-V: Linear Programming

1.   Linear Programming

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Unit-VI: Probability

1.   Probability

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean of random variable.

**Internal Assessment   Class XII
Marks:20**

S. No.	Topic	Marks
1	Activities Performed Throughout the Year (10 Activities)	05
2	Record of Activities	05
3	Activity performed during year- end test	03
4	Viva based on activities	02
5	Continuous Assessment	05
	Total	**20**

Note: For activities NCERT Lab Manual may be referred.

Assessment of Activity Work:

Throughout the year any 10 activities shall be performed by the student from the activities given in the NCERT Laboratory Manual for the respective class (XI or XII) which is available on the link: http://www.ncert.nic.in/exemplar/labmanuals.html a record of the same may be kept by the student. An year end test on the activity may be conducted

Prescribed Books:

1) Mathematics Textbook for Class XI, NCERT Publications
2) Mathematics Part I - Textbook for Class XII, NCERT Publication
3) Mathematics Part II - Textbook for Class XII, NCERT Publication

Note- The contents those are part of syllabus but not part of NCERT textbooks for the year 2024-25 are to be taught in classroom by teacher but not to be tested in examinations by schools and examination board.

Code	Subject Name	L	T	P
BSCT 101	**Engineering Mathematics - I**	**3**	**1**	**0**

Common to all B.Tech. branches except B.Tech. Biotechnology and B.Tech. Agricultural Engineering. (Effective from the Session: 2018 – 2019)

OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

- To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.
- To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To familiarize the student with functions of several variables that is essential in most branches of engineering.
- To develop the essential tool of matrices and linear algebra in a comprehensive manner.

Unit 1: Matrices   **10 hours**
Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Hermitian and skew-Hermitian matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem and its applications, and Orthogonal transformation.

Unit 2: Calculus – I   **6 hours**
Rolle's Theorem, Lagrange's Mean value theorems and Cauchy Mean value theorem, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

Unit 3: Calculus – II   **8 hours**
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions

Unit 4: Sequences and series   **10 hours**
Convergence of sequence and series, tests for convergence (Ratio test, D' Alembert's test, Raabe's test); Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Unit 5: Multivariable Calculus (Differentiation)   **8 hours**
Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Approximation of errors, Method of Lagrange multipliers; Gradient, curl and divergence.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition,Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
5. U.S. Rana, Engineering Mathematics for First Semester, Anand Publications, 2008
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Code	Subject Name	L	T	P
BSCT 102	Engineering Mathematics - II	3	1	0

Common to all B.Tech. branches except B.Tech. Biotechnology and B.Tech. Agricultural Engineering. (Effective from the Session : 2018 – 2019)

OBJECTIVES:

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To introduce effective mathematical tools for the solutions of differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.

Unit 1: First order ordinary differential equations: **6 hours**

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Unit 2: Ordinary differential equations of higher orders: **8 hours**

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Unit 3: Multivariable Calculus (Integration):   **10 hours**

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities);Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes (without proof) simple applications involving cubes, sphere and rectangular parallelepipeds.

Unit 4: Complex Variable – Differentiation: **8 hours**

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

Module 5: Complex Variable – Integration: **8 hours**

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof);

Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Textbooks/References:
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 3. W. E. Boyce and R. C. 3. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. U.S. Rana, Engineering Mathematics for Second Semester, Anand Publications, 2008
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.