

# Syllabus for Engineering Mathematics-I

Course Title:	Engineering Mathematics-I
Course Code:	BS101/M-I
Number of Credits :	3(L: 2+1: T) P: 0
Pre Requisites :	1) Basic Formulae of Algebra, Trigonometry should be known 2) Preliminary knowledge of the vector
Total Contact Hours :	45 hrs.

**Aim:** Engineering Mathematics is the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with the need of engineering branches. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on the application of various contents like algebra, complex numbers, vectors, trigonometry and derivative. This course will develop analytical abilities to make exact calculations and provide a continuing educational base for the students.

**Course Objectives:** After the completion of the course the students will be able to

- apply the basic concepts of logarithm, complex number, quadratic equation and binomial theorem for solving the engineering and practical problems.
- find the solutions of vector oriented problems like work done, moment etc by applying vector algebra.
- simplify trigonometric expressions and solve trigonometric equations which will be useful in solving the scientific problems.
- analyze limit, continuity, derivatives of different functions and physical interpretation of derivatives which will be applicable in real situation.

## Course Content

### Unit-1

#### Algebra

##### 1.1 Logarithm:

**3 Hours**

1.1.1 Definition of natural and common logarithm.

1.1.2 General Properties of logarithm and simple problems

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## 1.2 Complex Numbers:

5 Hours

- 1.2.1 Definition of Complex numbers, Real and Imaginary parts of a complex number, Equality of two complex numbers, Conjugate of a complex number
- 1.2.2 Modulus and Argument of a complex number and simple problems
- 1.2.3 Polar and Cartesian forms of a complex number and their relation.
- 1.2.4 Algebraic operations (Addition, Subtraction, multiplication, Division) of complex numbers
- 1.2.5 De Moivre's Theorem (without proof) and simple problems.
- 1.2.6 Cube roots of unity and their properties with problems.

## 1.3 Quadratic Equations:

4 Hours

- 1.3.1 Definition of Quadratic Equations.
- 1.3.2 Finding the roots of a quadratic equation, conjugate roots & simple problems
- 1.3.3 Nature of the roots using discriminant & problems
- 1.3.4 Relation between roots and co-efficients & problems
- 1.3.5 Formation of quadratic equations if roots are given.

## 1.4 Binomial Theorem:

4 Hours

- 1.4.1 Definition of factorial of a number, permutation( ) & combination ( ) with formula only
- 1.4.2 Binomial Theorem (without proof) for any index, simple problems on positive index only
- 1.4.3 General Term and Middle Term and problems
- 1.4.4 Expansion of  $(1 + x)^n$ ,  $(1 - x)^n$ ,  $|x| < 1$ , exponential & logarithmic series only (no problem)

## Unit-2

### Vector Algebra

7 Hours

- 2.1 Definition of vector and types of vectors
- 2.2 Concept of a position vector and Ratio formula & simple problems
- 2.3 Rectangular resolution of a vector
- 2.4 Equality, addition, subtraction of vectors and multiplication of a vector by a scalar
- 2.5 Scalar (dot) and Vector (cross) product of two vectors with properties & simple problems
- 2.6 Application of dot product -- work done by a force, projection of a vector upon another
- 2.7 Application of cross product -- finding area of a triangle and parallelogram, moment of a force

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## Unit-3

### Trigonometry

10 Hours

- 3.1 Concept of trigonometrical angles, measurement of angles in degree, radian and grade & their relation only.
- 3.2 Trigonometrical ratios of angles, associated angles, Trigonometric ratios of some standard angles, problems
- 3.3 Compound angles formula (without proof), multiple, sub-multiple angles & simple problems
- 3.4 Solutions of Trigonometrical Equations, simple problems (angle lies between 0 and  $2\phi$ )
- 3.5 Inverse Circular Function & simple problems
- 3.6 Properties of triangle, basic formulae only

## Unit-4

### Function, Limit & Continuity, Derivative

#### 4.1 Function

2 Hours

- 4.1.1 Definition of variables & constants
- 4.1.2 Definition of function with examples, domain and range of a function
- 4.1.3 Types of functions (even-odd, increasing-decreasing, inverse, periodic) with simple examples
- 4.1.4 Graph of trigonometric functions,  $\sin x$ ,  $\cos x$ ,  $\tan x$  only

#### 4.2 Limit & Continuity

2 Hours

- 4.2.1 Definition of limit (with left hand limit & right hand limit), Fundamental Theorem on limit (only statement), standard limits and simple problems
- 4.2.2 Continuity of functions, elementary test for continuity of functions (finite limit)

#### 4.3 Derivative

8 Hours

- 4.3.1 Definition of derivatives
- 4.3.2 Derivatives of standard functions
- 4.3.3 Rules of differentiation of sum, difference, product and quotient of functions.
- 4.3.4 Derivatives of composite functions (Chain Rule)
- 4.3.5 Derivatives of inverse circular functions, implicit functions and logarithmic differentiation
- 4.3.6 Derivative of parametric functions, derivative of a function with respect to another function

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4.3.7 Second order derivatives with simple problems

4.3.8 Application of derivatives –Physical & Geometrical interpretation of derivative, checking increasing-decreasing functions, finding velocity & acceleration, Maxima-Minima of function of single variable with simple problems.

## Examination Scheme:

### A. Semester Examination pattern of 60 marks:

1. Objective questions- 20 marks (1 mark each question), (At least 5 question from each **group**)
2. Subjective questions- 40 marks (at least 2 questions of 10 marks from each **group**)

€ **Group- A** contains Unit-1 & Unit-2 (At least 40 marks); **Group-B** contains Unit-3 (At least 20 marks); **Group-C** contains Unit-4(At least 20 marks)

**N.B.-** Student will answer objective type questions of 20 marks and for subjective question of 40 marks, taking at least one question from each **group** of the above three **groups**.

### B. For the internal Assessment 40 marks:

1. Class Test Examination/Internal Examination; 20 marks; choose best two out of three Class Test Examinations/ Internal Examinations
2. Class Attendance; 10 marks
3. Viva/ Quiz/Presentation/Assignment/Project/Report etc.; 10 marks

