COURSE TITLE   : **ENGINEERING MATHEMATICS – II**
COURSE CODE   : **2002**
COURSE CATEGORY   : **F**
PERIODS/WEEK   : **6**
PERIODS/SEMESTER : **90**
CREDITS   : **6**

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	VECTOR ALGEBRA	14
	BINOMIAL SERIES	10
2	DETERMINANTS	8
	MATRICES	14
3	INDEFINITE INTEGRALS	10
	DEFINITE INTEGRALS	8
4	APPLICATIONS OF INTEGRATION - AREA & VOLUME	6
	DIFFERENTIAL EQUATIONS	10
5	TESTS, ASSIGNMENTS AND TUTORIALS (4 Periods per Unit)	10
	TOTAL	**90**

SPECIFIC OUTCOME

MODULE - I VECTOR ALGEBRA AND BINOMIAL THEOREM.

1.1.0   Vector Algebra
    1.1.1   Scalar and vector quantities.
    1.1.2   Definition of a vector.
    1.1.3   Representation of vectors.
    1.1.4   Name a directed line segment as a vector.
    1.1.5   Different types of vectors.
    1.1.6   Addition and subtraction of vectors in terms of the segment.
    1.1.7   Position vector of a point with reference to a point.
    1.1.8   Difference of two vectors with same initial point as position vector of a point.
    1.1.9   Orthogonal Cartesian axes ,the unit vectors i, j and k .
    1.1.10 Types of vector product (a) scalar product (b) vector product
    1.1.11 Scalar (dot) product and vector (cross) product.
    1.1.12 Properties of dot product and cross product (no proof)
    1.1.13 Simple problems to find
        (i) Work done by a force (application of scalar product)
        (ii) Moment of a force (application of vector product)

1.2.0 Binomial Theorem.
- 1.2.1 Concept of factorial
- 1.2.2 Meaning of nc_r and value of nc_r (No proof and no problems)
- 1.2.3 Use of nc_r in the expansion $(x + a)^n$, where n is positive integer.
- 1.2.4 State binomial theorem for a positive integer.
- 1.2.5 Expansion of $(x + a)^n$,and $(x - a)^n$ where n is positive integer. (Statement only).
- 1.2.6 General term of the expansion of $(x + a)^n$,and $(x - a)^n$
- 1.2.7 Properties of binomial expansion
- 1.2.8 Problems of the following types
  - 1.2.8.1 Expand using Binomial theorem
  - 1.2.8.2 Find a particular term in the expansion
  - 1.2.8.3 Find middle term(s)
  - 1.2.8.4 Find the coefficient of x^n
  - 1.2.8.5 Find constant terms in $(x + a)^n$,and $(x - a)^n$

MODULE - II DETERMINANTS AND MATRICES.

2.1.0 DETERMINANTS.
- 2.1.1 Definition of determinant by means of algebraic expression
- 2.1.2 Order of a determinant
- 2.1.3 Evaluation of determinants of 2nd & 3rd order --- problems.
- 2.1.4 Solution of a system of simultaneous linear equations in two unknowns
- 2.1.5 Solution of a system of simultaneous linear equations in three unknowns

2.2.0 MATRICES.

- 2.2.1 Definition of matrices
- 2.2.2 Order of matrices
- 2.2.3 Different types of matrices
- 2.2.4 Algebra of matrices such as
  Equality of matrices
  Addition of matrices
  Subtraction of matrices
  Scalar multiplication and Multiplication
- 2.2.5 Problems on algebra of matrices
- 2.2.6 Transpose of a matrix
- 2.2.7 Symmetric and skew-symmetric matrices
- 2.2.8 Determinant associated with a square matrix
- 2.2.9 Singular and non singular matrices
- 2.2.10 Minors and cofactors
- 2.2.11 Cofactor matrix
- 2.2.12 Adjoint of a matrix
- 2.2.13 Inverse of a matrix

2.2.14 Solution of a system of three linear equations in two unknowns using the inverse of the coefficient matrix.

MODULE - III INTEGRAL CALCULUS.

3.1.0 INTEGRAL CALCULUS.
3.1.1 Integration as reverse process of differentiation
3.1.2 List standard integrals.
3.1.3 Rules of integration.

$$1. \int kf(x)dx = k\int f(x)dx. \qquad 2. \int \{f(x) \pm g(x)\}dx = \int f(x)dx \pm \int g(x)dx$$

3.1.4 Simple problems using standard results and rules of integration.
3.1.5 Simple problems using algebraic simplification and trigonometric results.
3.1.6 Integration by substitution method.
3.1.7 Solve simple problems on substitution method
3.1.8 Evaluation of integrals of the form
$(1) \int x^{n-1} f(x^n)\, dx \qquad 2) \int \emptyset[f(x)] f(x)dx$
$3) \int f(x^n) f(x)\, dx \qquad 4) \quad \int \frac{f(x)}{f(x)} dx \qquad 5) \int f(ax+b)dx$
3.1.9 Integration by parts.
3.1.10 Solutions of problems of the type x sinx, x^2 cos x, (ax + b) e^x, x $\sin^2$x, log x, e^x sinx, x log x etc.,

3.2.0 DEFINITE INTEGRALS.
3.2.1 Meaning of $_a\int^b$ f(x) dx and definition of definite integral.(Correct notation)
3.2.2 Properties of definite integrals.
3.2.3 Problems of the same type as in indefinite integral using limits of integration.

MODULE – IV APPLICATIONS OF INTEGRATION

4.1.0 AREA AND VOLUME
4.1.1 Formulae for finding area bounded by a curve and volume of a solid of revolution (no proof)
4.1.2 Estimation of the area bounded by the curve y = f(x), the x- axis and the ordinates at x=a and x=b
4.1.3 Estimation of the area bounded by the curve y = f(x), and the x- axis
4.1.4 Estimation of the area enclosed between two curves $y_1 = f_1(x)$, and $y_2 = f_2(x)$
4.1.5 Simple problems to find the volume of solid of revolution.

4.2.0 DIFFERENTIAL EQUATIONS.

4.2.1 Definition of differential equation with examples
4.2.2 Order and Degree of D E with examples.
4.2.3 Solution of D E by variable separable method.
4.2.4 Problems on variable separable method.
4.2.5 Solution of a linear D E of the type $\dfrac{dy}{dx} + Py = Q$
4.2.6 Simple problems
4.2.7 Solution of D E of the type $\dfrac{d^2 y}{dx^2} = f(x)$
4.2.8 Simple problems

CONTENT DETAILS

MODULE - I

1.1 Vector Algebra

Scalar and vector quantities, Definition of a vector, Representation of vectors, Name a directed line segment as a vector, Different types of vectors, Addition and subtraction of vectors in terms of the segment, Position vector of a point with reference to a point, Difference of two vectors with same initial point as position vector of a point, Orthogonal Cartesian axes ,the unit vectors i, j and k , Types of vector product (a) scalar product (b) vector product, Scalar (dot) product and vector (cross) product, Properties of dot product and cross product (no proof), Simple problems to find (i) work done by a force (application of scalar product) (ii) moment of a force (application of vector product).

1.2 Binomial Theorem

Concept of factorial , Meaning of nc r and value of ncr (No proof and no problems), Use of ncr in the expansion (x + a)n , where n is positive integer, State binomial theorem for a positive integer, Expansion of (x + a)n ,and (x - a)n where n is positive integer(statement only), General term of the expansion of (x + a)n ,and (x - a)n, Properties of binomial expansion, Problems of the following types (a) expand using Binomial theorem, (b) to find a particular term in the expansion, (c) to find middle term(s), (d) to find the coefficient of x^n , to find constant terms in (x + a)n ,and (x - a)n,

MODULE - II Determinants and Matrices

2.1 Determinants

Definition of determinant by means of algebraic expression , Order of a determinant, Evaluation of determinants of 2nd & 3rd order --- problems, Solution of a system of simultaneous linear equations in two unknowns, Solution of a system of simultaneous linear equations in three unknowns

2.2 Matrices

Definition of matrices, Order of matrices, Different types of matrices, Algebra of matrices such as Equality of matrices, Addition of matrices, Subtraction of matrices, Scalar multiplication and Multiplication, Problems on algebra of matrices, Transpose of a matrix, Symmetric and skew-symmetric matrices, Determinant associated with a square matrix, Singular and non singular matrices, Minors and cofactors, Cofactor matrix, Adjoint of a matrix, Inverse of a matrix, Solution of a system of three linear equations in two unknowns , Using the inverse of the coefficient matrix.

MODULE - III

3.1 Integral Calculus

Integration as reverse process of differentiation, List standard integrals, Rules of integration,

$$1. \int kf(x)dx = k\int f(x)dx. \qquad 2. \int \{f(x) \pm g(x)\}dx = \int f(x)dx \pm \int g(x)dx$$

Simple problems using standard results and rules of integration, Simple problems using algebraic simplification and trigonometric results, Integration by substitution method, Solve simple problems on substitution method, Evaluation of integrals of the form,

(1) $\int x^{n-1} f(x^n)\, dx$ 2) $\int \emptyset[f(x)] f'(x)dx$ 3) $\int f(x^n) f'(x)\, dx$ 4) $\int \dfrac{f'(x)}{f(x)}\, dx$

5) $\int f(ax+b)dx$

 Integration by parts, Solutions of problems of the type x sinx, x^2 cos x, (ax + b) e^x, x $\sin^2$x, log x, e^x sinx, x log x etc.

3.2 Definite Integrals

Meaning of $_a\int^b$ f(x) dx and definition of definite integral.(Correct notation), Properties of definite integrals, Problems of the same type as in indefinite integral using limits of integration.

MODULE - IV

4.1 Area and Volume

Formulae for finding area bounded by a curve and volume of a solid of revolution (no proof), estimation of the area bounded by the curve y = f(x), the x- axis and the ordinates at x=a and x=b, Estimation of the area bounded by the curve y = f(x), and the x- axis , Estimation of the area enclosed between two curves y_1 = f_1(x), and y_2=f_2(x), Simple problems to find the volume of solid of revolution.

4.2 Differential Equations

Definition of differential equation with examples, Order and Degree of D E with examples,

Solution of D E by variable separable method, Problems on variable separable method,

Solution of a linear D E of the type $\dfrac{dy}{dx} + Py = Q$, Simple problems, Solution of D E of the type

$\dfrac{d^2 y}{dx^2} = f(x)$, Simple problems

NB: Emphasis is mainly placed in application oriented problems and hence proofs and derivations are not expected.

TEXT BOOK:

Engineering Mathematics-II for polytechnic colleges by different authors.

REFERENCE BOOK:

1. W.R Neelakanta   -   Applied Mathematics – Sapna Publications.

2. Dr. D S Prakash   -   Applied Mathematics – S Chand Publications

3. Calculus : One-Variable calculus Vol-I, 2edn. - Apostol,WILEY