

# AMEC01 MATHEMATICS III

## UNIT-1 PARTIAL DIFFERENTIATION AND PARTIAL DIFFERENTIAL EQUATION

- 1.1 Introduction, Limit, Partial derivatives, Partial derivatives of Higher orders, Which variable is to be treated as constant,
- 1.2 Homogeneous function, Euler's Theorem on Homogeneous Functions, Introduction,
- 1.3 Total Differential Coefficient, Important Deductions, Typical cases, Geometrical Interpretation of  $dx dz$ ,  $dy dz$ , Tangent plane to a surface,
- 1.4 Error determination, Jacobians, Properties of Jacobians, Jacobians of Implicit Functions,
- 1.5 Partial Derivatives of Implicit Functions by Jacobian, Taylor's series, Conditions for  $F(x, y)$  to be of two variables maximum or minimum, Lagrange's method of undermined Multipliers.

## UNIT-2 PARTIAL DIFFERENTIAL EQUATIONS

- 2.1 Partial Differential Equations, Order, Method of Forming Partial Differential Equations,
- 2.2 Solution of Equation by direct Integration, Lagrange's Linear equation, Working Rule, Method of Multipliers,
- 2.3 Partial Differential Equations non-Linear in  $p, q$ , Linear Homogeneous Partial Diff. Eqn.,
- 2.4 Rules for finding the complimentary function, Rules for finding the particular Integral, Introduction,
- 2.5 Method of Separation of Variables, Equation of Vibrating String, Solution of Wave Equation, One Dimensional Heat Flow, Two dimensional Heat Flow.

## UNIT-3 FOURIER SERIES

- 3.1 Periodic Functions, Fourier Series, Dirichlet's Conditions, Advantages of Fourier Series, Useful Integrals,
- 3.2 Determination of Fourier constants (Euler's Formulae), Functions defined in two or more sub spaces,
- 3.3 Even Functions, Half Range's series, Change of Interval, Parseval's Formula, Fourier series in Complex Form, Practical Harmonic Analysis.

## UNIT-4 LAPLACE TRANSFORMATION

- 4.1 Introduction, Laplace Transform, Important Formulae, Properties of Laplace Transforms, Laplace Transform of the Derivative of  $f(t)$ ,
- 4.2 Laplace Transform of Derivative of order  $n$ , Laplace Transform of Integral of  $f(t)$ , Laplace Transform of  $t.f(t)$  (Multiplication by  $t$ ),
- 4.3 Laplace Transform of  $1/t f(t)$  (Division by  $t$ ), Unit step function, second shifting theorem, Theorem, Impulse Function, Periodic Functions,
- 4.4 Convolution Theorem, Laplace Transform of Bessel function, Evaluation of Integral, Formulae of Laplace Transform, properties of Laplace Transform,
- 4.5 Inverse of Laplace Transform, Important formulae, Multiplication by  $s$ , Division of  $s$  (Multiplication by  $1/s$ ), First shifting properties, second shifting properties,
- 4.6 Inverse Laplace Transform of Derivatives, Inverse Laplace Transform of Integrals, Partial Fraction Method, Inverse Laplace Transform,

4.7 Solution of Differential Equations, Solution of simultaneous equations, Inversion Formulae for the Laplace Transform.

### **UNIT-5 NUMERICAL TECHNIQUES**

5.1 Solution of Ordinary Differential Equations,

5.2 Taylor's Series Method, Picard's method of successive approximations,

5.3 Euler's method, Euler's Modified formula, Runge's Formula, Runge's Formula (Third only),

5.4 Runge's Kutta Formula (Fourth order), and Higher order Differential Equations.

### **UNIT-6 NUMERICAL METHODS FOR SOLUTION OF PARTIAL DIFFERENTIAL EQUATION**

6.1 General Linear partial differential equations, Finite-Difference Approximation to Derivatives,

6.2 Solution of Partial Differential equation(Laplace's method), Jacobi's Iteration Formula, Guass-Seidal method,

6.3 Successive over-Relaxation or S.O.R. method, Poisson Equation, Heat equation (parabolic equations), Wave equation (Hyperbolic Equation).

#### **Reference Books:**

1. Transforms and Partial Differential Equations Paperback – 22 June 2011 by T Veerarajan (Author)
2. Transforms and Partial Differential Equations (III Semester) Paperback – 1 January 2014 by Gunavathi K. (Author)