MA 101: (Linear Algebra + Modern Algebra)

Module-I

Vector Space, definition and examples, subspaces, span of a set, linear dependence and independence, dimension and basis.

Linear Transformations, range and kernel, rank nullity, Inverse of linear transformation, consequences of rank nullity theorem, composition of linear maps,

Module – II

Matrices, Matrix associated with a linear map and linear maps associated with a matrix.

Matrix multiplication, rank and nullity of matrix, transpose of a matrix, Elementary row operations, systems of linear equations, Inverse of a matrix, Product of determinants, application to linear equations, Eigenvalues and eigenvectors.

Module – III

Integers, Definition of groups with examples, subgroups. Normal subgroups, quotient groups

Module – IV

Quotient groups, homomorphism, Definition and examples of rings, field, integral domain, ring homomorphism.

Text Book:

1. An Introduction to linear Algebra, V Krishna Murty & V.P. Mainra, J.L. Arora (EWP),East West press Pvt. Ltd.

2. Topics in Algebra, I.N. Herstein, John Wiley & Sons, Inc.

ML 101 (Math Lab-I)

Use of Matlab and C in solving the following Problems:

1. Algebraic operation on Matrices

2. Determinant of a Matrix. Transpose of a matrix, matrix inversion

3. Row echelon form, reducing a matrix to row echelon form, Finding inverse of a matrix using row echelon form

4. Solving system of equation

5. Finding eigenvalues and eigenvectors of a matrix. Diagonalization of a matrix

Text Book

1. E. Balguruswamy, Programming in C

2. Introduction to Matlab

MA 102 (Math-II)

Module-I

Algebra of real numbers, Order, Completeness, Density, Decimal representation of real numbers, One One correspondence ofsets, Cardinality, Countability

Countability of Q, Uncountability of R, Convergence of sequences, Limits of sequences, Limit theorems, Wierstrass completeness principle, Cantor's completeness principle (statement only),

Module-II

Convergence of series, Series of positive terms, Open sets, Closed sets, Limit points of sets

Bolzano Wierstrass theorem, Continuity, properties of continuous functions,

Module – III

Differentiability, Mean value theorems, Taylor's theorem and its application.

Module – IV

Riemann integration, Fundamental theorem of calculus, Improper integral.

Text Book

1. Fundamental of Mathematical Analysis by G.Das & S.Pattnaik.TMH Publishing Co.

2. Mathematical Analysis by S.C. Mallik and S, Arora

MA 201

Module –I

Ordinary differential equation of first order and first degree, Exact equation, Integrating factor, Equation reducible to linear form, Equation of first order but of higher degree, Equation solvable for p, y and x, Equation homogenous in x and y, Clairaut's and Lagrange's equation.

Module – II

Linear Equations with constant coefficients and with variable coefficients, second order ordinary differential equation.

Module – III

Functions of several variables ,Limit, Continuity, Partial derivatives, Mean value theorem, Differentiabillity, Partial derivatives of higher order, Young'stheorem (statement only), Schwartz theorem (statement only), Differentials of higher order, Functions of functions, change of variables, Taylor's theorem, Maclaurin's theorem, Extremum values.

Module – IV

Implicit Functions, Derivative of impllicit functions, Jacobians, Stationary values under subsidiary

conditions, Lagrange's method of multipliers, Improper integrals, Gamma, Beta functions ,

Differential operators, Integral Theorems: Line, Surface and volume integrals, Statement of Gauss, Stokes and Green's theorem (without proof) with applications.

Text Book:

1. A course on ordinary and partial differential Equation with Application-J. Sinha Roy & S Padhy (Kalyani Publishers)

2. Mathematical Analysis by S.C. Mallik and S, Arora

MA 202

Module – I

Computer representation of Numbers, Definition and Sources of error, Propagation of errors, Errors in summation.

Bisection method, Newton's method, Secant method, General theory of one point fixed point method, Roots of polynomials, System of nonlinear equations.

Module – II

Polynomial Interpolation theory, Newton Divided differences, Forward differences, Backward differences, Central differences, Interpolation formulas using divided difference, forward difference, backward difference, Interpolation error.

Trapezoidal rule, Simpson's rule, Newton-Cotes Integration formulas, Gaussian quadrature, Errors in Numerical Integration.

Module – III

Existence and Uniqueness of solution of ode, Euler method, Midpoint method, Trapezoidal method, Single step and Runge-Kutta Methods.

LPP- Mathematical formulations, graphical solutions

Module-IV

General LPP, Canonical and standard forms. Simplex method-Introduction, Simplex algorithm, Use of artificial variables, Big-M method or method of penalties, Solution of simultaneous equation using simplex method.

Text Book:

1. An introduction to numerical analsysis, Kendall E. Atkinson, John Wiley & Sons, Inc.

2. Operations Research - Kanti Swarup, P.K Gupta & Man Mohan (Sultan Chand & Sons)

ML 202 (Math Lab – II)

1. Number representation and errors in computation: Representation of integers and fractions, floating point arithmetics, source of errors, loss of significance, error propagation, computation of error estimation.

2. Solution of non-linear equations: Bisection method, secant method, Newton's method, Muller's method (Using Matlab)

3. Interpolations:Polynomial interpolation, Newton divided difference, cubic spline interpolation(Using Matlab).

4. Numerical integration and differentiation: Trapezoidal, Simpson's and Newton-Cotes rule, Guassian quadrature (Using Matlab).

6. Numerical solution of ODE: Euler's method, Runge-Kutta methods, multistep formulas(Using Matlab)

References:

1. Kendell A. Atkinson: An introduction to numerical analysis. John Wiley and Sons.

2. S.D. Conte, C. De Boor: Elementary Numerical Analysis: An Algorithmic Approach. Tata McGraw-Hill.

3. W.H. Press et. al.: Numerical Recipes: The Art of Scientific Computing. Cambridge University press.