

MAJOR (MJ)

MATPMJ02: Algebra

Credits 04, Full Marks: 75

MATPMJ02T: Algebra

Credits 04, Full Marks: 75

Course contents:

UNIT-1 (Classical Algebra):

Polar representation of complex numbers, n th roots of unity, De Moivre's theorem for rational indices and its applications; Theory of equations: Relation between roots and coefficients, transformation of equation, Descartes rule of signs, cubic and biquadratic equation.; Inequality: The inequality involving $AM \geq GM \geq HM$, Cauchy-Schwartz inequality.

UNIT-2 (Sets and Integers):

Equivalence relations, Equivalence Class; Functions, composition of functions, Invertible functions, one to one correspondence and cardinality of a set; Well-ordering property of positive integers, division algorithm, divisibility and Euclidean algorithm; Congruence relation between integers; Principles of Mathematical induction; statement of Fundamental Theorem of Arithmetic.

UNIT-3 (System of Linear Equations):

Systems of linear equations; row reduction and echelon forms; vector equations; the matrix equation $Ax=b$; solution sets of linear systems; applications of linear systems; linear independence.

UNIT-4 (Linear Transformation and Eigenvalues):

Inverse of a matrix; Characterizations of invertible matrices; Definition of vector space of $\mathbb{R}^n$; Subspaces of $\mathbb{R}^n$; Dimension of subspaces of $\mathbb{R}^n$; Rank of a matrix; Eigenvalues; Eigenvectors and characteristic equation of a matrix; Cayley-Hamilton theorem and its use in finding the inverse of a matrix; Introduction to linear transformations; Matrix of a linear transformation.

SKILL ENHANCEMENT COURSE (SEC)

MATPSEC02: MATLAB-2

Credits 03, Full Marks: 50

MATPSEC02P: MATLAB -2

Credits 03, Full Marks: 50

Course Outline:

Introduction to M-file: scripts and function, flow control statements, standard arrays library functions, standard matrix library functions, User-defined function: primary function, sub-function, private function, eval function, function handles, function of functions, library functions.

Importing and Exporting data, read spread sheet data, write spread sheet data, MAT-file

- I. Fitting a curve for given data.
- II. Plotting of given data: Graph plotting, multiple plots, matrix plots, polar plots, 3D plotting (line, surface, mesh, and contour) of three-dimensional data.
- III. Obtaining surface of revolution of curves.
- IV. Find the sum, product, max, min, sort of a list of number in an array, in a sub-array using library function.
- V. Find the column sum, product, max, min, sort of the given matrix using library function.
- VI. Find the row sum, product, max, min of the given matrix using library function.
- VII. Conversion of one number system to another number system among decimal, binary, octal, hexadecimal.
- VIII. Solution of a square, under determined and over determined system of linear equation.
- IX. Different problems for root, eigenvalues and eigenvectors of the matrix.
- X. Plotting of recursive sequences.
- XI. Study the convergence of sequences through plotting.
- XII. Verify Bolzano-Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot.
- XIII. Study the convergence/divergence of in finite series by plotting their sequences of partial sum.
- XIV. Cauchy's root test by plotting nth roots.
- XV. Ratio test by plotting the ratio of nth and (n+1)th term.