ADVANCED LINEAR ALGEBRA

PROF. PREMANANDA BERA

Department of Mathematics
IIT Roorkee

PRE-REQUISITES : Linear Algebra B.Sc /BE I/II year

INTENDED AUDIENCE : Master students of Mathematics,,Physics, B.Tech III Year Electrical, Computer Science.

COURSE OUTLINE :

This course is designed to provide students with an understanding of Mathematical concept on Linear algebra that includes basic as well as advanced level. Attempt is taken to cover both Both theoretical as well as computation perspectives. There are six componenets: (i) Linear System of equations, (ii) Vector spaces, (iii) Linear transformations, (iv) Cannonical forms and Jordan forms, (v) Inner product spaces and different operators in it, (vi) Bilinear and Quadratic forms, Orthogonal projection and Spectral theory, and (vii) Singular value decomposition.

ABOUT INSTRUCTOR :

Prof. Premananda Bera, Department of Mathematics, IIT Roorkee.

COURSE PLAN :

1.1 System of linear equation (Review)
1.2 Elementary matrix operation, elementary matrices,
1.3 Rank of matrix, Matrix inverse
1.4 Vector spaces,
1.5 Subspaces
1.6 Bases, and dimension
1.7 Ordered basis, coordinate matrix
1.8 Computation concerning subspaces
1.9 Linear transformation,
1.10 Existence of Linear transformation
1.11 Rank Nullity theorem(Review)
1.12 Representation of transformations by matrices
1.13 Change of ordered basis and matrix representation of transformations
1.14 Algebra of Linear Transformation
1.15 Linear operators and Linear Functional
1.16 Dual Space, Double dual spaces
1.17 Transpose of Linear transformation
1.18 Characteristic values, diagonalization, (Review)
1.19 Annihilating polynomials
1.20 Invariant subspace
1.21 Triangulation (2)
1.22 Simultaneous triangulation and simultaneous diagonalization
1.23 Direct sum decomposition
1.24 Invariant direct sums
1.25 The primary decomposition theorem
1.26 Jordan forms
1.27 Rational form
1.28 Inner product spaces
1.29 Gramian matrix, Gram Schmidt orthogonalization
1.30 Orthogonal complements, Best approximation
1.31 Operators on Inner product spaces
1.32 The adjoint of a linear operator
1.33 Normal and self adjoint operator
1.34 Unitary and orthogonal operators and their matrices
1.35 Bilinear and Quadratic forms
1.36 Orthogonal projections and the spectral theorem
1.37 *Generalized g-inverse of a matrix, The Singular value decomposition