COURSE 5: LINEAR ALGEBRA

Theory   Credits: 4   5 hrs/week

Course Outcomes
After successful completion of this course, the student will be able to
1. understand the concepts of vector spaces, subspaces
2. understand the concepts of basis, dimension and their properties
3. understand the concept of linear transformation and its properties
4. apply Cayley- Hamilton theorem to problems for finding the inverse of a matrix and higher powers of matrices without using routine methods
5. learn the properties of inner product spaces and determine orthogonality in inner product spaces.

Course Content
UNIT – I
Vector Spaces-I
Vector Spaces - General properties of vector spaces - n-dimensional Vectors - addition and scalar multiplication of Vectors - internal and external composition - Null space - Vector subspaces -Algebra of subspaces - Linear Sum of two subspaces - linear combination of Vectors- Linear span Linear independence and Linear dependence of Vectors.
UNIT –II
Vector Spaces-II
Basis of Vector space - Finite dimensional Vector spaces - basis extension - co-ordinates- Dimension of a Vector space - Dimension of a subspace - Quotient space and Dimension of Quotient space.
UNIT –III
Linear Transformations
Linear transformations - linear operators- Properties of L.T- sum and product of L.Ts - Algebra of Linear Operators - Range and null space of linear transformation - Rank and Nullity of linear transformations - Rank- Nullity Theorem.
UNIT –IV
Matrices
Characteristic equation - Characteristic Values - Characteristic vectors of a square matrix - Cayley Hamilton Theorem – problems on Cayley Hamilton Theorem.
UNIT –V
Inner product space
Inner product spaces- Euclidean and unitary spaces- Norm or length of a Vector- Schwartz inequality- Triangle Inequality- Parallelogram law- Orthogonality- Orthonormal set- Problems on Gram– Schmidt orthogonalisation process - Bessel's inequality.

Activities :
Seminar/ Quiz/ Assignments/Applications of Linear Algebra in real life problems\ Problem Solving.

Text Books
1.Linear Algebra by J.N. Sharma and A.R. Vasishtha, published by Krishna Prakashan
   Media (P) Ltd.
2.Matrices by A.R.Vasishtha and A.K.Vasishtha published by Krishna Prakashan
   Media (P) Ltd.

Reference Books

1. Linear Algebra by Stephen H. Friedberg et. al. published by Prentice Hall of India Pvt. Ltd. 4th Edition, 2007
2. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson education low priced edition), New Delhi.
3. Matrices by Shanti Narayana, published by S.Chand Publications

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COURSE 6: VECTOR CALCULUS

Theory   Credits: 4   5 hrs/week

Course Outcomes

Studentsaftersuccessfulcompletionofthecoursewillbeableto
1. Learnmultipleintegrals asanaturalextensionofdefiniteintegraltoafunctionoftwovariables inthecaseofdoubleintegral/threevariables inthecaseoftripleintegral.
2. Learnapplicationsintermsoffindingsurfaceareabydoubleintegralandvolumebytripleintegral .
3. Determinethegradient,divergenceandcurlofavectorandvectoridentities.
4. Evaluateline,surfaceandvolumeintegrals.
5. understand relation between surface and volume integrals (Gauss divergence theorem),relationbetweenlineintegralandvolumeintegral(Green'stheorem),relationbetween lineandsurfaceintegral(Stokestheorem)

Course Content

Unit–1
MultipleIntegrals-I
Introduction -Doubleintegrals -Evaluationofdoubleintegrals –Propertiesofdouble integrals - Regionofintegration   -doubleintegrationinPolarCo-ordinates   – Changeofvariablesindoubleintegrals -changeoforderofintegration.

Unit–2
Multipleintegrals-II
Tripleintegral   -regionofintegration   -changeofvariables   -Plane   areasbydoubleintegrals   - surfaceareabydoubleintegral -Volumeasadoubleintegral,volumeasatripleintegral.

Unit–3
Vectordifferentiation
Vectordifferentiation –ordinary - derivativesofvectors – Differentiability –Gradient –Divergence - Curloperators - Formulaeinvolvingtheseparators.

Unit–4
Vectorintegration
Line Integralswithexamples - Surface Integralwithexamples - Volumeintegralwithexamples.
Unit–5
Vectorintegrationapplications
Gausstheoremandapplicationsof   Gausstheorem   -   Green'stheoreminplane   and applicationsofGreen'stheorem - Stokes'stheoremandapplications ofStokestheorem.

Activities
Seminar/ Quiz/ Assignments/ Applications of Vector calculus to Real life Problems /Problem Solving Sessions.

Text Book

A text Book of Higher Engineering Mathematics by B.S.Grawal, Khanna Publishers, 43rd Edition

ReferenceBooks

1. Vector Calculus by P.C.Matthews, Springer Verlag publications.
2. Vector Analysis by Murray Spiegel, Schaum Publishing Company, NewYork

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