

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	LINEAR ALGEBRA
CourseCode:	1ET1000109
Pre-requisiteCourse:	Calculus

CourseObjective:

- CO1-To develop abstract, logical and critical thinking and the ability to reflect critically upon their work.
- CO2-Express physical phenomenon in mathematical formulation.
- CO3-Apply Matrix algebra in formal representation of various computing constructs.
- CO4-The student must be able to formulate a mathematical model of a real life and engineering problem, solve and interpret the solution in real world.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	2	-	5	28	70	12	30	-	-	-	-	100

CourseContents			
Sr. No	Topic	Total Hours	Weightage (%)
1.	BetaandGammafunction: Gammafunction,Betafunction,RelationbetweenBetaandGammafunctionsandtheirproperties.	3	7
2.	VectorsinR^nanditsproperties: Vectorsin R^n ,DotProduct,NormandDistance,Cauchy-SchwartzInequality,TriangleInequality,PythagoreanTheorem.	3	7
3.	MatricesandSystemofLinearEquations: Revision,Rankofamatrix,Normalformofamatrix,Consistencyofsystemoflinearequations andExamples.	5	12
4.	VectorSpaces: Definition, Examples of vector spaces, Vector subspace, Linear Independence anddependence, Linear span of set of vectors, Basis and Dimension, Extension to basis,Row space, Column space, Null space of a matrix, Rank and nullity of a matrix,DimensionTheorem(Rank–Nullitytheorem).	10	24
5.	EigenvaluesandEigenvectors: EigenvaluesandEigenvectors,Eigenspaceofamatrix,AlgebraicandGeometricmultiplicity,Diagonalization,OrthogonalDiagonalization,Powerofamatrix,Cayley-HamiltonTheorem,ApplicationtoQuadratic forms.	6	14

6.	InnerProductSpaces: InnerProduct, DotProduct on R^n , InnerProductSpaces, OrthonormalBases, Orthogonal Complements, Projection Theorem, GramSchmidt Process, Application to Least Squares.	7	17
7.	InfiniteSeries: Definition of a sequence, Divergence and Convergence of a sequence, Sandwich Theorem for sequences, Infinite Series, Comparison test, Cauchy's integral test, De'Alembert's ratio test, Cauchy's root test, Leibniz's rule for alternating series, Power series, Range of convergence, Uniform convergence.	8	19

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

Reference Books:

1. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition, Ninth Edition.
2. Calculus, Volume 2, T. M. Apostol, Wiley Eastern. Second Edition.
3. Introduction to Linear Algebra with Application, Jim DeFranza, Daniel Gagliardi, Tata McGraw-Hill, First Edition
4. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication, 9th Edition.
4. Linear Algebra and its Applications, Gilbert Strang, Cengage Learning, Fourth Edition.

List of Open Source Software/learning website:

- <https://onlinecourses.nptel.ac.in>
- <http://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring2010/video-lectures>
- <http://ocw.mit.edu/courses/mathematics/18-02-multivariable-calculus-fall-2007/video-lectures>

LAB/Practical- NA

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Familiarize with special functions to evaluate some proper and improper integrals using beta and gamma functions	2 Understanding 3 Applying
CLO2	Define the vector space, subspace and use of rank nullity theorem. Find a basis and the dimension of the subspace spanned by given vectors. Determine if a set of vectors are linearly independent	1 Remembering, 3 Applying
CLO3	Apply elementary transformations to reduce the matrix into the echelon form and normal form to determine its rank and interpret	2 Understanding, 3 Applying

	the various solutions of system of linear equations.	
CLO4	Identify the special properties of a matrix such as the eigen value, eigen vector, Use orthogonal transformations to express the matrix into diagonal form, quadratic form and canonical form	2 Understanding, 3 Applying
CLO5	Applying the properties of the inner product, the norm, the distance function, and the Cauchy Schwartz inequality in an inner product space. Computing the orthogonal complement of a subspace of an inner product space	2 Understanding, 3 Applying
CLO6	Apply convergence tests of series and evaluate sum of some selected convergent series.	3 Applying 5 Evaluate

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M														
CLO2	M		L													
CLO3	M	H														
CLO4	H		M													
CLO5		H	M													
CLO6		H	M													

H:High, M:Medium, L:Low