

Branch Name:	Computer Engineering / Information Technology / Artificial Intelligence and Data Science / Information and Communication Technology / Mechanical Engineering / Civil Engineering/ Electrical Engineering / Robotics & Automation / Artificial Intelligence & machine learning / Electronics& Communication Engineering/ AI Powered Cloud and DevOps
Program Code:	ET103 / ET105 / ET108 / ET107 / ET101 / ET106 / ET109 / ET113/ ET114 / ET115/ ET116
Course Title:	Engineering Mathematics-II with Computing tools
Course Code:	2ET1000102T
Pre-requisite Course:	Matrix algebra and Calculus

Course Objectives: After successful completion of the course, student will be able to

1. Develop abstract, logical and critical thinking and the ability to reflect critically upon their work.
2. Express physical phenomenon in mathematical formulation.
3. Apply Matrix algebra in formal representation of various computing constructs.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
03	03	-	-	03	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1.	Matrix and Linear Algebra Revision, REF, RREF, Rank of a matrix by REF& RREF, Consistency of system of linear equations and examples, Inverse by Gauss-Elimination and Gauss-Jordan methods, Eigen values and Eigen vectors, Eigen space of a matrix, Algebraic and Geometric multiplicity, Diagonalization, Orthogonal Diagonalization, Power of a matrix, Cayley Hamilton Theorem, Application to Quadratic form.	16	40
2.	Vector space Vector space & subspace, Linear independent and dependent vectors, basis and dimension, the four fundamental subspaces (row space, null space, column space, left null space).	10	25
3.	Linear Transformations Some standard transformations (Reflection, Projection, Rotation and Magnification or Contraction) orthogonal vectors, orthogonal and orthonormal bases, orthogonality of vectors using Projections & Gram- Schmidt Orthogonalization.	10	25
4.	Sequences and Series Definitions of a sequence divergence and convergence of a sequence, Sandwich theorem for sequences, Arithmetic Series, Geometric Series, Harmonic Series, P-series, limit comparison test, Alternating series , Leibniz's test for Alternating series, Cauchy's integral test, De' Alembert's ratio test, Cauchy's root test, , Power series, ROC, ROI	09	10

Text Books:

1. B.S. Grewal, Elementary Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2. Gilbert Strang, "Linear Algebra and its Applications", Cengage Publishers, 4th Edition, 2014.
3. MD Riasinghaniya, Matrix Algebra

Reference Books:

1. Erwin Kreyszig; Advanced Engineering Mathematics, 9th Edition, 2012.
2. B V Ramana; Higher Engineering Mathematics, 12th Reprint Edition, 2018.
3. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition, Ninth Edition.

List of Open-Source Software/learning website:

- <https://onlinecourses.nptel.ac.in>
- <https://home.iitk.ac.in/~arlal/book/nptel/pdf/LAl11.html>
- <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:

List of Experiments	Marks
1. Creating vectors, row vectors and column vectors. 2. Create different matrices and explore its rows, columns, and diagonals. 3. Perform different basic operation of vectors on above created matrices. 4. Perform different basic operation of matrices on above created matrices. 5. Explore length (), dim (), ncol (), nrow () operators on above matrices and vectors. 6. Explore commands for Selecting and extracting elements from above matrices and arrays. 7. Solution of system of equations using matrix method. 8. Solution of system of equations using Gauss elimination method. 9. Finding eigen values and eigen vectors.	50

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

Course Outcomes	Description	Bloom's Taxonomy Level
CLO1	Use matrix algebra to solve system of linear equations and determine Eigen values and Eigen vectors and Eigen value decomposition and singular value decomposition.	Understanding (2)
CLO2	Use Cayley Hamilton Theorem to evaluate inverse and power of matrix.	Applying (3)
CLO3	Demonstrate the concept of Vector spaces and sub spaces.	Applying (3)
CLO4	Examine principles of matrix algebra, linear transformations and orthogonality.	Analyzing (4)
CLO5	Examine the nature of infinite series.	Understanding (2)

Mapping of CLO with PO and PSO:

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	M		L							L				
CLO2	M	M														
CLO3	H	M	L									L				
CLO4	M	M										L				
CLO5	H	M	M		L											

H: High, M: Medium, L: Low