LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATION

I Semester: AE | CSE | IT | ECE | EEE | ME | CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS002	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Understand the basic theory of complex functions to express the power series.
II. Evaluate the contour integration using Cauchy residue theorem.
III. Enrich the knowledge of probability on single random variables and probability distributions.

COURSE LEARNING OUTCOMES (CLOs):

1. Demonstrate knowledge of matrix calculation as an elegant and powerful mathematical language in connection with rank of a matrix.
2. Finding rank by reducing the matrix to Echelon and Normal forms.
3. Determine inverse of the matrix by Gauss Jordon Method.
4. Apply the method of LU Decomposition and solve the simultaneous equations.
5. Use the method of LU factorization real world problems such as circuit designing and solving complex circuits.
6. Use the method of LU factorization real world problems such as economize and accumulate sums in double precision Computer Programme.
7. Interpret the Eigen values and Eigen vectors of matrix for a linear transformation and use properties of Eigen values.
8. Understand the concept of Eigen values in real world problems of control field where they are pole of closed loop system.
9. Apply the concept of Eigen values in real world problems of mechanical systems where Eigen values are natural frequency and mode shape.
10. Use the system of linear equations and matrix to determine the dependency and independency.
11. Determine a modal matrix, and reducing a matrix to diagonal form.
12. Evaluate inverse and powers of matrices by using Cayley-Hamilton theorem.
13. Solving differential equations of first order.
14. Finding orthogonal trajectories of Cartesian and polar equations.
15. Apply the first order differential equations in real world problems such as Newton's Law of cooling and Law of natural growth and decay.
16. Solving Second and higher order differential equations with constant coefficients.
17. Apply the second order differential equations for real world problems of electrical circuits and simple harmonic motion.
18. Apply the Mean value theorems for the single variable functions.
19. Understand the basic concepts of Partial Differential equations.
20. Determine Jacobin for the coordinate transformation.

21. Apply the technique of Jacobin and inverse Jacobian relation to real world problems such as kinematics and inverse kinematic solutions of robot manipulators.
22. Understand the techniques of multidimensional change –of –variables to transform the coordinates by utilizing the Jacobian.
23. Apply maxima and minima for functions of several variable's and Lagrange's method of multipliers.
24. Understand the concept and acquire the knowledge for attempting the competitive exams.

Unit-I	**THEORY OF MATRICES**	**Classes: 10**

Real Matrices**:** Symmetric, skew-symmetric and orthogonal matrices; Complex matrices: Hermitian, Skew-Hermitian and unitary matrices; Elementary row and column transformations, elementary matrix, finding rank of a matrix by reducing to Echelon form and normal form; Finding the inverse of a matrix using elementary row/column transformations: Gauss-Jordan method; Solving of linear system of equations by LU decomposition method.

Unit -II	**LINEAR TRANSFORMATIONS**	**Classes: 08**

Cayley-Hamilton theorem: Statement, verification, finding inverse and powers of a matrix; Linear dependence and independence of vectors; Linear transformation; Eigen values and eigen vectors of a matrix; Properties of eigen values and eigen vectors of real and complex matrices; Diagonalization of matrix.

Unit -III	**DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS**	**Classes: 10**

Formation of a differential equation; Differential equations of first order and first degree: Exact, non exact, linear equations; Bernoulli equation; Applications of first order differential equations: Orthogonal trajectories; Newton's law of cooling; Law of natural growth and decay.

Unit -IV	**HIGHER ORDINARY LINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS**	**Classes: 09**

Linear differential equations of second and higher order with constant coefficients, non homogeneous term of the type $f(x)=e^{ax}, \sin ax, \cos ax$ and $f(x)=x^n, e^{ax}v(x), x^n v(x)$; Method of variation of parameters; Applications to electrical circuits and simple harmonic motion.

Unit -V	**FUNCTIONS OF SINGLE AND SEVERAL VARIABLES**	**Classes: 08**

Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem and generalized mean value theorems-without proofs. Functions of several variables: Functional dependence, Jacobian, maxima and minima of functions of two variables without constraints and with constraints; Method of Lagrang multipliers.

Text Books:

1. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012.

Reference Books:

1. RK Jain & SRK Iyengar, "Advanced Engineering Mathematics", Narosa Publishers, 5th Edition, 2016.
2. Ravish R Singh, Mukul Bhatt, "Engineering Mathematics-1", Tata Mc Graw Hill Education, 1st Edition, 2009.

3. Srimanthapal & Suboth C.Bhunia, “Engineering Mathematics”, Oxford Publishers, 3rd Edition, 2015.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resourcs/#Mathematics
3. http://www.sosmath.com

E-Text Books:

1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering mathematics-ktu-ebook-download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks.