Course Type	Course Code	Name of Course	L	T	P	Credit
IC	NMCI102	Engineering Mathematics-II	3	0	0	3

Course Objective

The objective of the course is to present an introduction to basic concepts of linear algebra and differential equations, both ordinary and partial differential equations.

Learning Outcomes

Upon successful completion of this course, students will:
- have a broad understanding of linear algebra.
- be able to use the techniques of linear algebra and differential equations for solving variety of problems arising in science and engineering.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Matrices, System of linear equations, Gauss elimination method, Gauss-Jordon method for finding inverse of a matrix.	4	This unit will help students to see the generalization of the properties of $\mathbb{R}^2$ and $\mathbb{R}^3$ to $\mathbb{R}^n$, learn about new terms such as rank, nullity and their use to solve system of linear equations. Also students will learn to investigate properties of vector spaces and subspaces using by linear transformations.
	Vector spaces over $\mathbb{R}$ and $\mathbb{C}$, Subspace, Linear span, Linear independence and dependence, Basis, Dimension.	6	
	Linear transformation, Kernel and Range of a linear map, Rank-Nullity Theorem. Rank of a matrix, Row, column and Null spaces, Representation of linear maps by matrices.	6	
2	Eigenvalues and eigenvectors, Caley-Hamilton theorem (without proof), Algebraic and geometric multiplicity.	4	This unit will help students to understand the basic idea eigenvalues and eigenvectors with their use in diagonalization of matrices and quadratic forms.
	Diagonalization, Orthogonal diagonalization, Quadratic forms.	3	
3	First order differential equations (exact equations, integrating factors and Bernoulli equations, orthogonal trajectories.),	4	Students will be able to understand the notion of first order differential equations with applications as well as the existence and uniqueness of their solutions.
	Lipschitz condition, Picard's theorem (existence and uniqueness theorem).	3	
4	Linear dependence and Wronskian, Linear ODE with constant coefficients of second and higher order.	3	This unit will help students to learn about the concept of higher order linear differential equations with various methods to find their solutions.
	Methods for finding C.F. and P.I., Method of variation of parameters, Cauchy-Euler equations.	5	
5	Linear and non-linear partial differential equations of first order, Lagrange's equations, Charpit's method.	4	Students will be able to understand the linear and nonlinear first order partial differential equations with methods to find their solutions.

Text Books:
1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics (4th Edition), Narosa (2014).
2. E. Kreyszig, Advanced Engineering Mathematics (8th Edition), John Wiley (1999).

Reference Books:
1. G. Strang, Linear Algebra and its Applications (4th Edition), Thomson (2006).
2. W. E. Boyce and R. C. Di Prima, Elementary Differential Equations (8th Edition), John Wiley (2005).