

Course Type	Course Code	Name of Course	L	T	P	Credit
IC	MCI102	Mathematics-II	3	1	0	11

#### 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	Vector spaces over R and C, Linear independence and dependence, Basis	4	This unit will help students to see the generalization of the properties of $R^2$ and $R^3$ to $R^n$ , 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.
	Matrices and Gauss elimination, Row space, Null space and column space, Rank of a matrix	3	
	Systems of linear equations	2	
	Linear transformations, Matrix of a linear transformation, Rank-nullity theorem	3	
2	Eigenvalues and eigenvectors, Caley-Hamilton theorem (without proof) and its applications, Algebraic and geometric multiplicity	3	This unit will help students to understand the basic idea eigenvalues and eigenvectors with their use in diagonalization of matrices and quadratic forms.
	Diagonalization, Spectral theorem for real symmetric matrices, Quadratic forms, Applications of eigenvalues and eigenvectors	4	
3	First order differential equations (exact equations, integrating factors and Bernoulli equations, orthogonal trajectories.),	3	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).	2	
4	Linear dependence and Wronskian, Linear ODE with constant coefficients of second and higher order,	5	This unit will help students to learn about the concept of higher order differential equations with various methods to find their solutions.
	Cauchy-Euler equations, Method of undetermined coefficients, Method of variation of parameters, System of linear differential equations with constant coefficients	3	
5	Linear and non-linear partial differential equations of first order, Lagrange's equations, Charpit's method,	3	Students will be able to understand the linear and nonlinear partial differential equations with methods to find their solutions.
	Linear partial differential equations of second order and their classification, Methods for finding C.F. and P.I. of equations with constant coefficients, Method of separation of variables.	4	

#### Text Books:

1. 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).
3. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics (4th Edition), Narosa (2014).