

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NMCC515	Differential Equations	3	1	0	4

Course Objective
<ul style="list-style-type: none"> To enable the students to understand the theory of Ordinary and Partial Differential Equations and their utility in solving real-world problems arising in mathematical physics and engineering.
Learning Outcomes
<ul style="list-style-type: none"> Students will get expertise to solve problems in mathematical physics and engineering.

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	Introduction, Series solutions of ODE: Ordinary points, Power series solutions, Regular singular points, Frobenius method	5L+2T	From this topic, students will understand advanced methods when complexity arises in the coefficients of differential equations.
2	Legendre differential equation, Legendre function, Orthogonal properties, Generating function. Bessel differential equations, Bessel function properties, Generating function.	8L+3T	This unit will help students to understand transform technique to solve problems easily. Furthermore, students will learn special type of differential equations for engineering applications.
3	Second order boundary value problems, Self-adjoint eigen value problems, Sturm-Liouville Systems. Stability of a Linear and Nonlinear Systems.	8L+3T	From this topic, students will learn another special type of differential equation and its solution properties. In addition, they will learn boundary value problems and applications.
4	First order PDE: Introduction, Cauchy Problem, Quasi-Linear PDE, Non-linear PDE.	6L+3T	This unit will help students to learn the genesis of first-order PDE and solution methods. Also, they understand their occurrence in engineering.
5	Second order PDE: classification, reduction to canonical form, different boundary conditions, Solution of Laplace and Poisson equations in 2D using method of separation of variables	8L+3T	From this topic, students will learn different methods to solve second-order PDE. Also, they understand their occurrence in engineering.
6	Solution of wave and heat equations in homogeneous and non-homogeneous cases, Solution of PDE using the Laplace transform method.	7L+3T	This unit will help students to apply the Laplace transform method to get solutions of PDE. Also, they will learn advanced methods for complicated equations.
Total		42L+14T	

Text Books

1. G.F. Simmons, Differential Equations with Applications and Historical Notes, Tata McGraw-Hill Edition, Delhi (2003)
2. T. Amaranath, An Elementary Course in Partial Differential Equations, 2nd Ed. Narosa Publishing House, Chennai (2002)

Reference Books

1. Tyn Myint-U, Ordinary Differential Equations, North-Holland, Newyork (1978).
2. Tyn Myint-U, L. Debnath, Linear Partial Differential Equations for Scientists and Engineers. Birkhäuser Boston (2007)