DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to all branches)

Course Code	23BS1201	**Year**	**I**	**Semester**	II
Course Category	Basic Science	**Branch**	CSE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Pre-requisites**	NIL
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Interpret** the basic concepts of differential equations and vector calculus (L2).
CO2	**Apply** different methods to solve ordinary differential equations and partial differential equations, L-C-R Circuit problems (L3).
CO3	**Apply** the differential operator to calculate the divergence and flux of vector point functions (L3).
CO4	**Analyze** the given ordinary differential equation and partial differential equation to find the solution (L4).
CO5	**Analyze** the given data to find work done, flux using line and surface integrals, areas and volumes using vector integral theorems (L4).

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: Substantial, 2: Moderate, 1: Slight)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**
CO1	2											1	
CO2	3											1	
CO3	3											1	
CO4		3						1	1			1	
CO5		3						1	1			1	

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Differential equations of first order and first degree** Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay.	**CO1,CO2, CO4**
II	**Linear differential equations of higher order(Constant Coefficients)** Definitions, complementary function, general solution, particular integral, Wronskian, Method of variation of parameters. Applications to L-C-R Circuit problems.	**CO1,CO2, CO4**
III	**Partial Differential Equations** Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.	**CO1,CO2, CO4**
IV	**Vector differentiation** Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl.	**CO1,CO3, CO5**
V	**Vector integration** Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.	**CO1,CO3, CO5**

Learning Resources

Text Books:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers, 2017, 44th edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig,JohnWiley&Sons,2018,10th Edition

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R.K.Jain and S.R.K.Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B.V.Ramana, McGraw Hill Education, 2017

E-Resources:

1. https://nptel.ac.in/courses/111/105/111105121/
2. https://nptel.ac.in/courses/111/105/111105122/
3. https://nptel.ac.in/courses/111/107/111107108/