

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Code	23BS1201	Year	I	Semester	II
Course Category	Basic Science	Branch	MECHANICAL	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	Evaluate work done; flux using line and surface integrals, areas and volumes using vector integral theorems (L4).
CO6	Submit a report by solving the given problems using the concepts of Differential equations and Vector Calculus.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2												1	
CO2	3												1	
CO3	3												1	
CO4		3											1	
CO5		3											1	
CO6									3	3		3	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,CO6
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,CO6
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,CO6
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,CO6
V	Vector integration Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stokes theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.	CO1,CO3, CO5,CO6
Learning Resources		
Text Books:		
1. Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers, 2017, 44th Edition. 2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10 th Edition		
Reference Books:		
1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14 th 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, 5 th Edition. 4. Advanced Engineering Mathematics, R.K.Jain and S.R.K.Iyengar, Alpha Science International Ltd., 2021 5 th Edition (9 th reprint). 5. Higher Engineering Mathematics, B.V.Ramana, Mc Graw 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/		