CH/CE/ME121	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	L	T	P	C	Int	Ext
		2	1	-	3.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. To enlighten the learners in the concept of differential equations and multivariable calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Solve the first order ordinary differential equations related to various engineering fields.
2. Solve second order ordinary differential equations by analytical methods.
3. Identify solution methods for partial differential equations that model physical processes.
4. Interpret the physical- meaning of different operators such as gradient, curl and divergence and estimate the work done against a field, circulation and flux using vector calculus

UNIT I [CO:1] **(12)**

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.

UNIT II [CO:2] **(12)**

Linear differential equations of second order: Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral to , sin(ax+b), cos(ax+b). Wronskian, Method of variation of parameters. Cauchy's homogeneous linear equation and Legendre's linear equation.

UNIT III [CO:3] **(12)**

Partial differential Equations: Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, Equations solvable by direct integration, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations of second order with constant coefficients: , sin(ax+by), cos(ax+by).

UNIT IV [CO:4] **(12)**

Vector Calculus

Vector Differentiation: Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, Divergence and Curl, vector identities (without proofs).

Vector Integration: Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof).

LEARNING RESOURCES:

TEXT BOOK:

B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.

REFERENCE BOOK(s):

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd., 5th Edition (9th reprint), 2021.