EE/EC121	DIFFERENTIAL EQUATIONS, TRANSFORMS 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, transforms 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:

At the end of the course, the students will be able to

1. solve the ordinary and partial differential equations related to various engineering fields.
2. apply Laplace transforms to solve physical problems arising in engineering.
3. apply Fourier transforms to solve physical problems arising in engineering.
4. interpret the physical meaning of different operators such as gradient, curl and divergence and to 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. Linear differential equations of second order: Solution by method of variation of parameters.

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.

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

Laplace Transforms: Introduction, Properties of Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n division by t, evaluation of integrals, Laplace transform of periodic function. Inverse Laplace transforms-method of partial fractions, other method of finding inverse transforms : $t\,f(t) = L^{-1}\left[-\frac{d}{ds}F(s)\right]$, Convolution theorem.

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

Applications to differential equations: Solving second order ordinary differential equations with constant coefficients using Laplace transforms.

Fourier transform Fourier transform, Fourier sine and cosine transforms and inverse transforms.

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

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

Vector Integration: Line integral, surface integral, 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.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/