B.Tech II Year I Semester
LAPLACE TRANSFORMS AND COMPLEX VARIABLES (LTCV)

Course Code: 21MA301BS **L/T/P/C: 3/0/0/3**

Course Objectives:

- The definition of integral transforms and Laplace Transform.
- Properties of Laplace transform and Inverse Laplace Transform, Convolution theorem.
- Solution of Differential equations using Laplace transform and
- Integration of complex valued function Evaluation of integrals using Cauchy's integral formula
- Taylor's series, Maclaurin's series and Laurent's series expansion of Complex functions
- Evaluation of integrals using residue theorem
- Transform a given function from z-plane to w-plane
- Identify the transformation like translation, magnification, rotation and reflection and inversion
- Properties of bilinear transformations

Course Outcome:

- The student able to solve certain differential equations using Laplace Transform.
- Also, able to transform functions on time domain to frequency domain using Laplace transforms
- The students will be able to analyze the complex functions with reference to their analyticity, Integration using Cauchy's integral theorem.
- Find the Taylor's and Laurent's expansion of complex functions.
- The conformal transformation of complex functions can be dealt with ease

UNIT-I

LAPLACE TRANSFORMS

Definition of Integral transform, Domain of the function and Kernel for the Laplace transforms. Existence of Laplace transform. Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem –Dirac's delta function, Periodic function

UNIT-II

INVERSE LAPLACE TRANSFORMS

Inverse Laplace transform by Partial fractions (Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by" s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem –- Solving ordinary differential equations by Laplace transforms.

UNIT-III

Complex Functions –Differentiation and Integration: Complex functions and its representationonArgandplane,ConceptsoflimitContinuity,Differentiability,Analyticity,Cauchy-Riemannconditions,Harmonicfunctions Milne – Thompson method .Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem–Cauchy's integral formula– Generalized integral formula.

UNIT-IV

Power series expansions of complex functions and contour Integration: Radius of convergence–Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point – Isolated singular point – pole of order m – essential singularity. Residue – Evaluation of residue by formula and by Laurent series – Residue theorem.

UNIT-V

Formal mapping:

Transformation of z-plane to w-lane by a function, conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection, Transformations like e^z, log z,z^2, and Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformationwhenmappingsof3pointsaregiven.

TEXT BOOKS:

1. Advanced engineering Mathematics by Kreyszig, John Wiley Sons Publishers.

2. Higher Engineering Mathematics by B.S.Grewal, Khanna Publisher

REFERENCES BOOKS :

1.Advanced Engineering Mathematics by R.K.Jain&S.R.K.Iyengar,3rdedtion, Narosa Publishing.

2. Engineering Mathematics– III by T.K.V.Iyengar, B.KrishnaGandhi &Others, S.Chand.

3. Engineering Mathematics –III by G.ShankerRao & Others I.K.InternationalPublications

4.Advanced Engineering Mathematics, MichaelGreenberg,SecondEdition,PearsonEducation

5.Complex Variables Principles and Problem Sessions by A.K.kapoor,WorldScientificPublish

6.Mathematics for Engineers by K.B. Datta and M. AS. Srinivas, Publications