

MATHEMATICS-IV
(EEE, MECH)

Instruction	4 Periods per week (3 Theory + 1 Tutorial)
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

- To introduce transforms like Laplace, Fourier , Z-transforms and their properties
- To introduce a few numerical methods to solve certain types of problems
- To understand curve fitting, correlation and regression

Outcomes:

At the end of the course students will be able to

- solve differential equations using Laplace and Fourier transforms
- solve difference equations using Z-transforms
- find numerical solution of algebraic, transcendental equations and ordinary differential equations.
- perform a regression analysis and to compute and interpret the coefficient of correlation

UNIT- I

Laplace transforms: Introduction of Laplace transforms, sufficient condition for existence of Laplace transform, Laplace transform of Derivatives, Laplace transform of integrals, Translation theorems (I & II shifting theorems), Differentiation of Laplace transform (Multiplication by t), Integration of Laplace transform(Division by t), convolution theorem, Solving initial value problems using Laplace transform.

UNIT- II

Fourier transforms: Introduction, Fourier integrals, Fourier sine and cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier sine and cosine transforms, Finite Fourier sine and cosine transforms, Properties of Fourier transforms, Convolution theorem for Fourier transforms.

UNIT- III

Z-Transforms: Introduction, basic theory of Z-transforms, Z-transforms of standard sequences, existence of Z-transform, linearity property, translation theorem, scaling property, initial and final value theorems, differentiation of Z-transform, convolution theorem, solution of difference equations using Z-transforms.

UNIT- IV

Numerical methods: Solution of Algebraic and Transcendental equations: Bisection method, Newton-Raphson method, Solution of linear system of equations: Gauss elimination method, Gauss- Seidel iteration method, Interpolation: Lagrange's interpolation, Newton's divided difference interpolation, Newton's Forward and Backward difference interpolations, Numerical differentiation, Numerical solutions of ordinary differential equations : Taylor's series method, Euler method, Runge-Kutta method of 4th order.

UNIT- V

Curve fitting: Curve fitting by method of least squares, correlation and regression, types of correlations, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, equal ranks, equations to the lines of regression.

Suggested Reading:

1. R.K.Jain & S.R.K.Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4th Edition, 2014.
2. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
3. Vasishtha and Gupta, *Integral Transforms*, Krishnan Prakashan Publications, 2014.
4. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 9th Edition, 2012.
5. S.C.Gupta and V.K.Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, 2014.

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