Introduction to Special Functions and Integral Transforms

| MA1602| 4 Credits | 3104

Session: Jan – May 18 | Faculty: Dr. Garima Agarwal| Class: B.Sc. VI Semester

COURSE OBJECTIVES: At the end of the course, students will be able to

[1602.1] Understand the concept of special functions.

[1602.2] Understand the concept of Laplace Transform and its applications which helps to improve their

analytical skill to make them employable.

[1602.3] Understand the concept of Fourier Transform and its applications which helps to improve their analytical skill to make them employable.

A. SYLLABUS

Special functions: Gauss hypergeometric function and its properties; Integral representation; Gauss theorem; Vandermonde's theorem; Kummer's theorem; Relation of contiguity; Confluent hypergeometric function; Integral representation; Kummer's relation; Bessel functions and their properties; Convergence; Recurrence relations; Generating functions, Orthogonality of Bessel functions; Legendre polynomials; Generating function; Orthogonal property of Legendre's polynomials; Recurrence relations; Rodrigue's formula. **Laplace transform:** Existence theorem for Laplace transform; Linearity of the Laplace transform; Shifting theorem; Laplace transforms of derivatives and integrals; Differentiation and integration of Laplace transform; Laplace transform of some special functions; Inverse Laplace transform; Convolution theorem; Inverse Laplace transforms of derivatives and integrals; Method of partial fraction; Solution of ordinary differential equations using Laplace transform. **Fourier transform:** Sine, cosine and complex Fourier transform; Linearity property; Shifting; Fourier transform of derivatives; Relations between Fourier transform and Laplace transform; Inverse Fourier transform; Convolution theorem; Parseval's identity for Fourier transform.

B. TEXT BOOKS

1. M. D. Raisinghania, Advanced Differential Equations, S. Chand & Comp., New Delhi, 2010.
2. Davies, Integral Transforms and Their Applications, 3rd Edition, Springer, 2002.
3. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 4th Edition, Narosa Publishing House, 2014.