**MAT-121 Ordinary Differential Equations and Integral Transforms L T P *C* : 3 1 0 4**

**Objective: *The aim of this course is to give an exposure to Ordinary Differential equations as well as different types of Integral Transforms to first year students. The utility of Laplace transform in solving differential equations is emphasized. Fourier Series and Fourier Transforms are also introduced. The concepts related to these tools are useful in mathematical modeling of a system encountered in their further course of study. Some elementary applications of differential equations in simple electrical circuits are considered that lays the foundation of modeling aspects through differential equations. Various existing techniques of finding solutions are discussed which teaches the students in using them in situations of interests in engineering.***

***Prerequisite: MAT-111***

**Module-I Contact Hours: 16**

**Ordinary Differential Equations**: Exact differential equations, Equations reducible to exact differential equations, linear differential equations of second and higher order with constant coefficient, complementary function and particular integral, Complete solution, Method of variation of parameters, Cauchy's and Legendre's linear equations, System of linear differential equations with constant coefficients, Singular points, Power series solution by the method of Frobenius and it’s application in solving Bessel’s and Legendre’s equations, Applications of linear differential equations.

**Module-II Contact Hours: 12**

**Laplace Transform:** Definition and Existence of Laplace Transform, Properties of Laplace transforms, LT of Unit step function and Dirac Delta Functions, Transforms of derivatives and integrals, multiplication and division by t, Evaluation of integrals by Laplace transforms, Convolution theorem, Inverse Laplace transforms, Application of Laplace Transform.

**Module-III Contact Hours: 6**

**Fourier series:** Euler’s formulae, Dirichlet’s condition for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series,

**Module-IV Contact Hours: 6**

**Fourier Transforms :** Fourier integrals, Complex Fourier transforms, Fourier sine and cosine transform, Shifting theorem, Fourier transforms of derivatives, Convolution theorem.

**Text Books:**

**1.Advanced Engineering Mathematics : *R. K. Jain and S. R. K. Iyengar,*** Narosa Publishers***.***

**2. Advanced Engineering Mathematics :** ***Peter V. O’Neil*** , Pearson Education, Asia.

**Reference Books:**

**1. Advanced Engineering Mathematics :** ***Michael D. Greenberg***, Pearson Education, Asia

**2. Advanced Engineering Mathematics : *E. Kreyszig***, John Wiley & Sons.