Course Syllabi: UMA004 Mathematics - II (L : T : P :: 3 : 1 : 0)

1. **Course number and name**: UMA004 Mathematics - II

2. **Credits and contact hours**: 3.5 and 4

3. **Text book, title, author, and year**

   Text Books / Reference Books

   - *Simmons, G.F., Differential Equations (With Applications and Historical Notes), Tata McGraw Hill (2009).*
   - *Krishnamurthy, V.K., Mainra, V.P. and Arora, J.L., An introduction to Linear Algebra, Affiliated East West Press (1976).*
   - *Kreyszig Erwin, Advanced Engineering Mathematics, John Wiley (2006), 8^{th} ed.*
   - *Jain, R.K. and Iyenger, S.R.K , Advanced Engineering Mathematics, Narosa Publishing House(2011), 11^{th} ed.*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Linear Algebra: Row reduced echelon form, Solution of system of linear equations, Matrix inversion, Linear spaces, Subspaces, Basis and dimension, Linear transformation and its matrix representation, Eigen-values, Eigen-vectors and Diagonalisation, Inner product spaces and Gram-Schmidt orthogonalisation process.

   Ordinary Differential Equations: Review of first order differential equations, Exact differential equations, Second and higher order differential equations, Solution techniques using one known solution, Cauchy - Euler equation, Method of undetermined coefficients, Variation of parameters method, Engineering applications of differential equations.

   Laplace Transform: Definition and existence of Laplace transforms and its inverse, Properties of the Laplace transforms, Unit step function, Impulse function, Applications to solve initial and boundary value problems.

   Fourier Series: Introduction, Fourier series on arbitrary intervals, Half range expansions, Applications of Fourier series to solve wave equation and heat equation

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:

   - Solve the differential equations of first and second order and basic application problems described by these equations.
   - Find the Laplace transformations and inverse Laplace transformations for various functions. Using the concept of Laplace transform students will be able to solve the initial value and boundary value problems.
   - Find the Fourier series expansions of periodic functions and subsequently will be able to solve heat and wave equations.
   - Solve systems of linear equations by using elementary row operations.
   - Identify the vector spaces/subspaces and to compute their bases/orthonormal bases. Further, students will be able to express linear transformation in terms of matrix and find the eigen values and eigen vectors.

6. **Brief list of topics to be covered**
    - Linear Algebra
    - Ordinary Differential Equations
    - Laplace Transform
    - Fourier Series