Course title and code: Introduction to Differential Equations, MATH225

Pre-requisites for this course: Differential and Integral Calculus, MATH201

1. Classification of differential equations and their origin: interval of definition, Solutions, Cauchy initial value problems: Existence and Uniqueness.

2. Method of solving of first order differential equations: Separable equations, exact equations, special integrating factors, substitution and transformation, linear differential equations with constants coefficients, Bernoulli equations, method of reduction of order.

3. Higher order linear differential equation (HOLDE): Basic theory of HOLDE Existence-Uniqueness theorem, linearly independent and dependent functions, Wronskian.

4. Method of solving of HOLDE: Homogeneous linear equation with constant coefficients, method of variation of parameters, undetermined coefficient method, superposition principle, Cauchy-Euler equations, reduction of order method.

5. Laplace transformations: Definitions and properties, inverse Laplace transformation, applications: solving initial value problems.

6. Power series: Solutions of linear differential equations of second order with Polynomial coefficients near an ordinary point.

7. Linear system of differential equations: Solving system by elimination, matrix methods for linear system.