Semester	**1**
Course *1	**Major-1**
Paper Code	C1MT230111T
Paper Title	**Differential Equations-1**
No. of Credits *2	**4**
Theory / Practical / Composite	**Theory**
Minimum No. of preparatory hours per week a student has to devote	**4**
Number of Modules	**Nil**
Syllabus	***First Order ODE*** **[13]**: Genesis of Ordinary differential equations from geometry and other fields [2]. Exact differential equations of first order [2]. Non exact differential equations of first order and integrating factors, linear equation and Bernoulli equations, special integrating factors and transformations.[5] First order ode of higher degree: equations solvable for x, y and p. Clairaut's equations and differential equations transformable into Clairaut's form. Singular solutions. [4] ***Higher order ODE*** **[22]**: General solution of linear homogeneous differential equation of second and higher order, principle of superposition. Wronskian to check independency of functions.[4] Linear inhomogeneous equations of higher order with constant coefficients [5] Cauchy-Euler's equation [2] Method of undetermined coefficients [2] Second order differential equations with variable coefficients—finding complementary function in terms of a known integral. Method of variation of parameters to solve inhomogeneous equations [6] Exact higher order ode [3] ***System of ODE*****[17]:**Reduction of higher order linear differential equations into a system of first order linear differential equations [2] Differential operators, solving a system of homogeneous and non-homogeneous linear ODE's of two variables by operator method [5] Expressing a system of homogeneous linear ODE into $\frac{d\vec{X}}{dt} = A\vec{X}$ form where $\vec{X}$ has there or more component and solving them using eigenvalue[5].Introduction to generalised eigenvector.
Learning Outcomes *3	On successful completion of the course a student will be able to do the following:

	• Investigate real-world framework to realize when ordinary differential equations (ODEs) or systems of ODEs are appropriate, formulate problems mathematically and innovatively model these real-life phenomena to solve the problems and infer if the results are rational, and finally very aptly interpreting the results. • Solve first order ODE's utilizing the standard techniques for separable and exact differential equations. • Identify integrating factors for first order non-exact ODE's and solve them; Linear Equations of first order and Bernoulli's Equations as special cases. • Obtain general solutions of first order higher degree ODE's; Clairaut's Equations in particular; Identification of singular solutions and interpreting them geometrically. • Explore some of the basic theory of linear ODEs, gain ability to recognize certain basic types of higher-order linear ODEs for which exact solutions may be obtained, and to apply the corresponding methods of solution. • Obtain the general solution of non-homogeneous 2^{nd} and higher order linear differential equations as a linear combination of Complementary Function and Particular Integral. • Obtain the general solution of non-homogeneous linear ODE with constant co-efficients by the method of undetermined co-efficients. • Find general solution of 2^{nd} and higher order linear ODE with variable co-efficients by the method of variation of parameters and to solve exact higher order ODE's. • Understand the connection between system of linear equations and system of first order differential equations. • Solve system of ODE's using operator and eigen value method.
Reading/Reference Lists *[4]	• S.L. Ross: Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.

	• G.F.Simmons: Differential Equations with Historical Notes. • TynMyint-U and Lokenath Debnath: Linear Partial Differential Equations for Scientists and Engineers, 4th edition, Springer, Indian reprint, 2006. • Martha L Abell, James P Braselton: Differential Equations with MATHEMATICA, 3rd Ed., Elsevier Academic Press, 2004. • R. Kent Nagle, Edward B. Saff, Arthur David Snider: --Fundamentals of Differential Equations (8 th Ed.),Pearson. • R. Kent Nagle, Edward B. Saff, Arthur David Snider:Fundamentals of Differential Equations (8 th Ed.),Pearson. • D.A.Murray: Differential Equations [Orient Longmann]. • Ghosh & Chakraborty: Ordinary Differential Equations. Online Lectures: • https://youtu.be/_LX1p0VFkp4 • https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/	
Evaluation	Theory CIA: 20+5+5=30 Semester Exam: 70	Practical (if applicable) CA: Semester Exam:
Paper Structure for Theory Semester Exam	7 questions each carrying 10 marks out of 12/13 questions	