

Part A: Introduction			
Program: Diploma Course		Class: B. A / B.Sc. Part II	Year: 2022 Session: 2023-2024
1	Course Code	Paper – MATH-3T	
2	Course Title	Differential Equations	
3	Course Type	Theory	
4	Pre-requisite ( if any)	No	
5	Course Learning Outcome (CLO)	<p><b>This Course will enable the students to:</b></p> <ul style="list-style-type: none"> <li>• Understand the genesis of ordinary as well as partial differential equations.</li> <li>• Learn various techniques of getting exact solutions of certain solvable first order differential equations and linear differential equations of second order.</li> <li>• Know Picard's method of obtaining successive approximations of solutions of first order ordinary differential equations, passing through a given point in the plane.</li> <li>• Learn about solution of first order linear partial differential equations using Lagrange's method.</li> <li>• Know how to solve second order linear partial differential equations with constant coefficients.</li> <li>• Formulate mathematical models in the form of ordinary and partial differential equations to problems arising in physical, chemical and biological disciplines.</li> </ul>	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks :

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	<b>First Order Differential Equations:</b> Basic concepts and genesis of ordinary differential equations, Order and degree of a differential equation, Differential equations of first order and first degree, Equations in which variables are separable, Homogeneous equations, Linear differential equations and equations reducible to linear form, Exact differential equations, Integrating factor, First order higher degree equations solvable for $x$ , $y$ and $p$ , Clairaut's form and singular solutions; Picard's	12

	method of successive approximations and the statement of Picard's theorem for the existence and uniqueness of the solutions of the first order differential equations.	
II	<b>Second Order Linear Differential Equations:</b> Statement of existence and uniqueness theorem for the solution of linear differential equations, General theory of linear differential equations of second order with variable coefficients, Solutions of homogeneous linear ordinary differential equations of second order with constant coefficients, Method of variation of parameters and method of undetermined coefficients, Reduction of order, Euler-Cauchy equations, Coupled linear differential equations with constant coefficients.	12
III	<b>First Order Partial Differential Equations:</b> Genesis of Partial differential equations (PDE), Concept of linear and non-linear PDEs, Methods of solution of Simultaneous differential equations of the form: $dx/P(x,y,z) = dy/Q(x,y,z) = dz/R(x,y,z)$ , Lagrange's method for PDEs of the form: $P(x,y,z)p + Q(x,y,z)q = R(x,y,z)$ , where $p = \partial z / \partial x$ and $q = \partial z / \partial y$ ; Solutions passing through a given curve.	12
IV	<b>Second order Partial differential equations:</b> Principle of superposition for homogeneous linear PDEs, Relation between solution sets of non-homogeneous linear PDEs and their corresponding homogeneous equations, Reducible and irreducible homogeneous equations and their solutions in various possible cases, Solution of non-homogeneous reducible equations using Lagrange's method for first order equations.	12
V	<b>Applications:</b> Orthogonal trajectories of one-parameter families of curves in a plane, Minimum velocity of escape from Earth's gravitational field, Newton's law of cooling, Malthusian and logistic population models, Radioactive decay, Free and forced mechanical oscillations of a spring suspended vertically carrying a mass at its lowest tip, Phenomena of resonance, LCR circuits, Surfaces orthogonal to a given system of surfaces.	12

### Part C - Learning Resource

#### Text Books and Reference Books:

1. Erwin Kreyszig . *Advanced Engineering Mathematics* (10<sup>th</sup> edition). J. Wiley & Sons 2011
2. B. Rai & D. P. Choudhury. *Ordinary Differential Equations - An Introduction*. Narosa Publishing House Pvt. Ltd. New Delhi. 2006
3. Shepley L. Ross. *Differential Equations* (3<sup>rd</sup> edition). Wiley. 2007
4. George F. Simmons. *Differential Equations with Applications and Historical Notes* (3<sup>rd</sup> edition). CRC Press. Taylor & Francis. 2017

TSM



5. Ian N. Sneddon. *Elements of Partial Differential Equations*. Dover Publications. 2006

**E-Resources:**

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. Differential equation  
[https://www.youtube.com/watch?v=NBcGLLU90fM&list=PLbMVogVj5nJSGlf9sluucwoby\\_rzz6gID](https://www.youtube.com/watch?v=NBcGLLU90fM&list=PLbMVogVj5nJSGlf9sluucwoby_rzz6gID)
3. Partial Differential equation  
<https://www.youtube.com/watch?v=Kk5SEzASkZU&list=PL9m2Lkh6odgKbfY03TFRhwjOqW79UdzK8>

**Part D: Assessment and Evaluation**








Suggested Continuous Evaluation Methods:









Maximum Marks:

50 Marks

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

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