

Course Objectives: The objective of this course is to introduce ordinary differential equations and fundamental theorems for existence and uniqueness. This course further explains the analytic techniques in computing the solutions of various ordinary differential equations appearing in various fields of science and technology.

PROGRAM SPECIFIC OUTCOMES: At the end of the program, the student will be able to:

PSO1	Apply the knowledge of mathematical concepts in interdisciplinary fields.
PSO2	Understand the nature of abstract mathematics and explore the concepts in further details.
PSO3	Model the real-world problems in to mathematical equations and draw the inferences by finding appropriate solutions.
PSO4	Identify challenging problems in mathematics and find appropriate solutions.
PSO5	Pursue research in challenging areas of pure/applied mathematics.
PSO6	Employ confidently the knowledge of mathematical software and tools for treating the complex mathematical problems and scientific investigations.
PSO7	Continue to acquire mathematical knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematics.
PSO8	Comprehend and write effective reports and design documentation related to mathematical research and literature, make effective presentations.
PSO9	Qualify national level tests like NET/GATE etc.
PSO10	Effectively communicate and explore ideas of mathematics for propagation of knowledge and popularization of mathematics in society.

Course Outcomes: At the end of the course, the students will be able to	
CO1	Understand ordinary differential equations of various types, their solutions, and fundamental concepts about their existence.
CO2	Understand the concept and applications of eigen value problems.
CO3	Understand differential equations of Sturm Liouville type.
CO4	Apply various power series methods to obtain series solutions of differential equations.
CO5	Discuss various kinds of special functions in detail, their properties and relations.
CO6	Solve problems of ordinary differential equations arising in various fields.

Mapping of course outcomes with the program outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	√	-	√	√	√	-	√	-	√	√
CO2	√	-	√	√	√	-	√	-	√	√
CO3	√	-	√	√	√	-	√	-	√	√
CO4	√	-	√	√	√	-	√	-	√	√
CO5	√	-	√	√	√	-	√	-	√	√
CO6	√	-	√	√	√	-	√	-	√	√

Unit I : Qualitative properties of solutions and Boundary value problems

Oscillations and the Sturm separation theorem, the Sturm comparison theorem, Eigen values, eigen functions and the vibrating string, Sturm – Liouville problems

Unit II : Some Special Functions of Mathematical Physics

Legendre polynomials, Properties of Legendre polynomials, Bessel's functions, the gamma function, properties of Bessel functions, Additional properties of Bessel functions

Unit III : System of First order Equations and Non linear Equations

General remarks on systems, Linear systems, Homogeneous linear systems with constant coefficients, Nonlinear systems. Volterra's prey- predator equations, Autonomous systems.

Unit IV: The Existence and Uniqueness of Solutions

The method of successive approximations, Picard's theorem, Systems. The second order linear equation

Text : **George F. Simmons, Differential Equations with Applications and Historical Notes, Second Edition, Tata McGraw Hill Publishing Company Limited**

References:-

1. Shepley L. Ross - Differential Equations, 3rd ed., (Wiley India).
2. E.A. Coddington - An Introduction to Ordinary Differential Equation, PHI.
3. W.E. Boyce & R.C. Diprima - Elementary Differential Equations and boundary value Problems, (Wiley India)
4. S. Balachandra Rao & H. Ranuradha – Differential Equation with Applications and Programs (Universities Press)

Evaluation Pattern:

Internal Assessment: Midterm exam:	1 x 30	= 30
	Quizzes, assignments, etc:	= <u>20</u>
		50
End-semester Examination:		= <u>50</u>
		<u>100</u>